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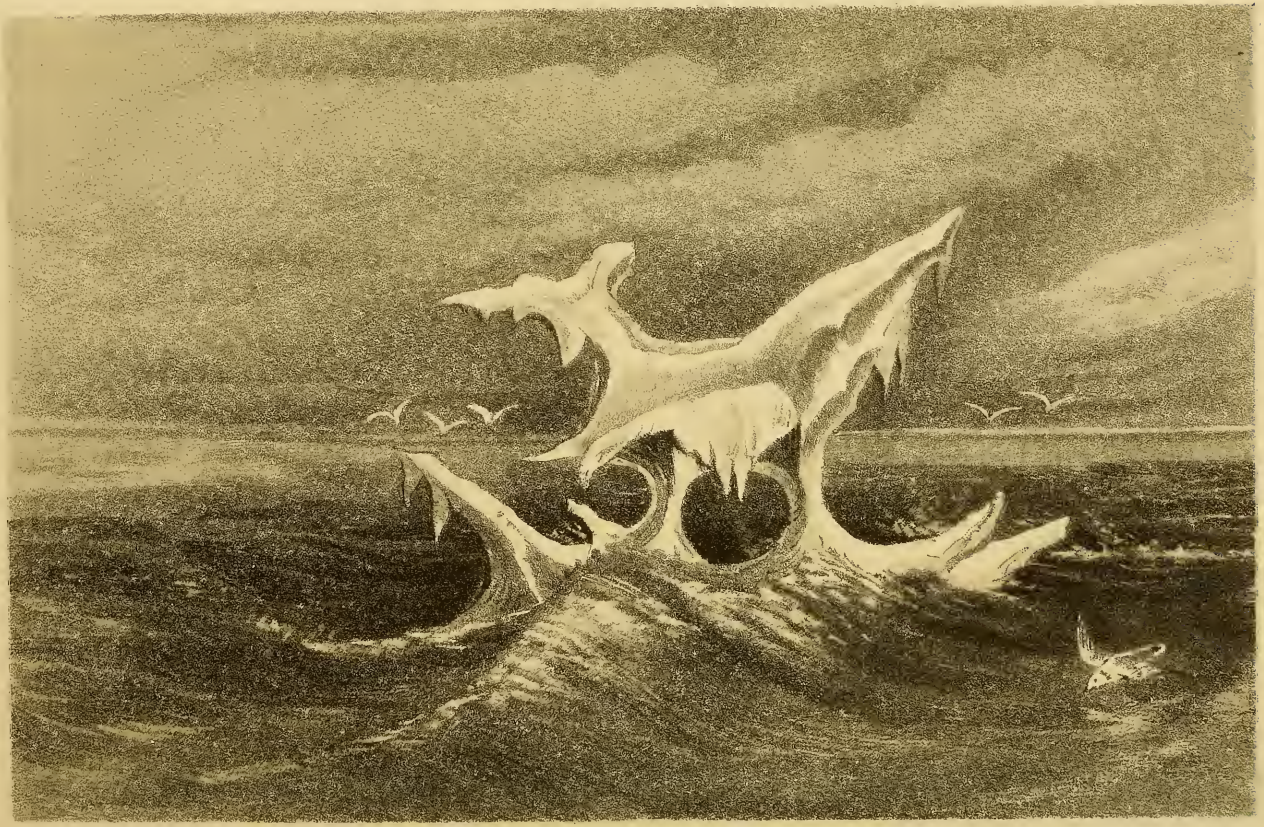

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A WAIF OF THE ARCTIC SEAS.

NATURAL HISTORY TRANSACTIONS

OF

NORTHUMBERLAND, DURHAM,

AND

NEWCASTLE-ON-TYNE,

BEING PAPERS READ AT THE

MEETINGS OF THE NATURAL HISTORY SOCIETY

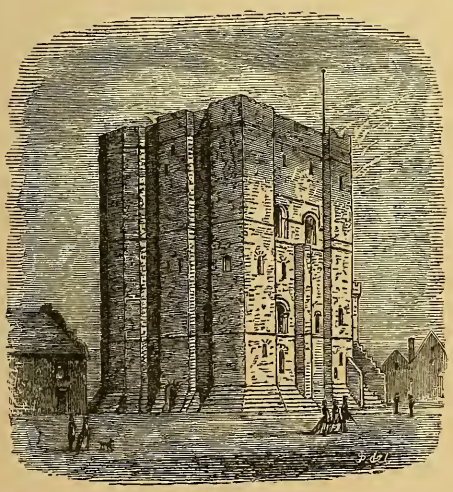
OF

NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE,

AND THE

TYNESIDE NATURALISTS' FIELD CLUB, 1880-89.

VOL. VIII.



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RICHARD HOWSE, *Editor*.

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CORRIGENDA.

Page 22, line 29, read Alston and Cross Fell.

,, 136, ,, 2, for 1879 read 1880.

,, 137, ,, 2, read 1881-1882.

,, 193, ,, 13, ,, Harbour Flats.

,, 361, ,, 20, for J. Brown read J. Losh.

NATURAL HISTORY TRANSACTIONS

OF

NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ BY THE PRESIDENT, THE REV. CANON TRISTRAM, LL.D., F.R S., ETC., AT THE THIRTY-FOURTH ANNIVERSARY MEETING, HELD IN THE MUSEUM OF THE NATURAL HISTORY SOCIETY, NEWCASTLE-UPON-TYNE, ON THURSDAY, APRIL 15TH, 1880.

Ladies and Gentlemen,—I cannot commence my address on the close of my year of office without recalling the fact, that it is just twenty years since I was called upon, by the partial favour of my naturalist friends, to perform a similar duty. I well remember the keen appreciation with which I received the invitation of your Committee to preside over your Society in 1859, and not less was my gratification at the summons which last year I received to head your phalanx during their annual forays. My sense of your kindness was all the greater, since, in the intervening period, I have been with you more frequently in spirit than in body. Your invitation told me that in spite of my infrequent attendances, you recognized that my love of nature and of God's works in nature had not diminished with increasing years, and that I owed the high honour you bestowed on me rather to your partiality than to my own deserts. But enough of egotism. I

desire, without further preface, to recall in chronological succession the memories of the pleasant and we trust not useless outings of the past year.

One remark applies to nearly all the meetings of the past year, that the weather was for the most part unpropitious, and staunch supporter as was your president of Lord Beaconsfield, no exceptional meteorological favour was shewn to the Club in the record of the excursions among which very few Queen's days were to be found.

The First Meeting was partially an exception, and on the 16th of May one hundred and ten members and friends mustered at Ravensworth, the grounds and rooms of which were, by the kindness of the Earl, thrown open to the inspection of the party.

After seeing the fine pictures in the galleries, the members proceeded through the grounds under the kind guidance of Mr. Wallace and Mr. Mould, and saw the damage caused by the unprecedentedly severe winter to the conifers and rarer evergreens. None but our hardiest natives and the Rhododendrons appeared to have escaped. After a pleasant ramble beyond the grounds fifty of the party returned to the Ravensworth Arms, Lamesley, to dinner. Here a paper was read by the Rev. A. Watts, of Durham, "On a Limestone Boulder found near Hawthorn, ground and scratched by glacial ice action." Mr. T. Thompson exhibited a nest with the unusual number of ten eggs of the Sparrow-hawk, taken in April, 1878, near Gilsland, in which nest this year a pair of Long-eared Owls had reared their young. The President spoke of the importance of the members of the Club interesting themselves in the preservation of the Roman remains recently discovered in the excavated camp at South Shields Lawe. A large portion of this has been generously handed over for preservation to the Corporation of South Shields by the Ecclesiastical Commissioners, and has since been carefully walled in and protected, it is to be hoped, from danger of further depredation.

It cannot be said that this meeting added much either to natural or archæological knowledge. It was perhaps too much of

the character of a pleasant picnic merely, but the backwardness of the season, as well as the locality and the weather, were in the highest degree unpropitious for either botanical or entomological research.

The Second Field Meeting was held at Rothbury on the 2nd and 3rd of June, and was attended by thirty-five members. The morning was showery, and about eleven o'clock the party drove in conveyances to Holystone and Harbottle. The geological features of the district were interesting and vividly described in passing by Mr. Howse. The broad valley of the Coquet, and mounds of alluvium, bordered on the south by lofty sandstone ridges, the heavy coating of snow still conspicuous on the Great Cheviot, a few Green Plovers with their young, and swarms of Sand Martins and other Hirundines, fresh arrivals from the South, a few Black-headed Gulls fishing along the Coquet, were the chief objects observed on the road to Holystone. Around this sacred fountain the usual spring flowers were in full bloom. Here we recalled the romantic history of the first planting of Christianity in Northumbria by Paulinus, and the thousands of our Saxon forefathers who at this spot listened to the preaching of the devoted missionary, and received baptism at his hand. A simple stone cross in the centre of the limpid basin is the only sculptured record of the history, which has been preserved by the records of Bede and others, though that first conversion was soon afterwards almost extinguished by the Danish inroads, but again relighted by St. Cuthbert and the heralds of Iona. After a long chat at the well and a taste of the pure water, the party visited the church and the remains of the religious house now attached to the farm buildings. Regaining the conveyances they proceeded towards Harbottle, not without mishap from the ambition of a local Jehu, but eventually they reached Alwinton Church built against the north bank of the Coquet, and presenting the singular feature of having its chancel elevated high above the rest of the floor of the church, and approached by a steep flight of steps, accommodating itself in an

unusual way to the site. As we stood on the bridge crossing the Coquet, the view to the North was instructive. Directly in front, the massive rounded bosses of the Cheviot porphyry rose abruptly from the village of Alwinton covered with grass only. Nearer to us, the immense crags of sandstone covered with heather predominated, and formed a striking contrast to the igneous rocks. On their return the majority of the party ascended to the Drake Stone and Harbottle Lough, in winter a dreary scene of wildness and desolation. Here the party were obliged to shelter themselves as best they could among crag and heather from a pelting hailstorm, sent down with indignant fury from old Cheviot accompanied with growls of distant thunder. After a run down hill and slight refreshment at the little village of Harbottle, a short peep at the old Peel Castle on its gravel mound, the party proceeded with all haste homeward, and enjoyed as only hungry pedestrians can do the bountiful repast prepared for them by Mr. and Mrs. English of the Rothbury Hotel. After dinner, votes of thanks were passed to Sir W. G. Armstrong and Major Cadogan.

The second day was devoted to a stroll through the grounds of Cragside, the princely residence of Sir W. G. Armstrong, who had most kindly thrown open the grounds to the members of the Club. The Japanese garden with its rare plants, the Conservatories and Fernery were duly visited and admired, and a long stroll through the grounds and adjacent hill side brought the party at last to the Thrum Gate. Here in ordinary circumstances the whole of Coquet rushes through a narrow channel cut into the sandstone rock to a great depth. The last train leaving Rothbury at four o'clock did not allow the party to explore the Coquet lower down; so, proceeding to the Inn, justice was amply done to the excellent meal at the hotel, and a rapid farewell to Rothbury and hurry to the train concluded this much enjoyed visit to this sub-alpine village.

The Third Field Meeting was held at Holy Island and Bamborough on the 7th and 8th of July. After breakfast at Belford

the party drove to Old Lawe, whence Mr. Bowey conveyed the party across the narrow channel to Holy Island. The huge whinstone dyke forming the south barrier, and perhaps protecting the whole Island from destruction, first met the eye, surmounted by those venerable piles of red sandstone carved and quaint, and covered with Wallflowers, an exquisite and contemporary miniature of Durham Cathedral, reproducing both in design and ornamentation the pure Norman style of that unrivalled fane. The Rev. W. F. Keeling kindly acted as guide to the Ecclesiastical antiquities of Lindisfarne. Afterwards some crossed to St. Cuthbert's Isle in search of Sea Lavender (*Statice limonium*) just coming into flower, and still lingering among the clefts of the basaltic rocks.

The Madwort was also seen growing in a garden, transplanted there by an intelligent native from a local habitat on the island. A visit to the old castle, on the fort of which a sixty-eight pounder had been recently mounted, for show we hope, as the firing of it would be certain destruction to the old building, and a short walk along the coast completed the day's work, and we felt that a week or more would not enable us to see all the rarities of this little islet. Big Danish looking men carried us on their brawny shoulders into the boats, and deposited us safe on the mainland. We enjoyed the sight of a brood of young Sheldrakes under the fostering care of a hen, and so tame as to take bread from the hand. Lines of Cormorants skimmed over the Flats, not a common sight now to the south of Farne Islands. After dinner at Belford some of the members left for Newcastle. The rest drove the next morning to Bamborough, and after spending a few hours in the castle, walked by way of Spindlestone Crags to Belford. On the crags they gathered *Allium oleraceum*, and the Chives in great abundance, *Sedum villosum*, *Dianthus deltoides*, and *Spiræa filipendula*, in great plenty. The large Ox-eye Daisy was in profusion all along the railway slopes. Mrs. Dunn of the Bell Inn supplied the personal comforts of the party perfectly. Two new members were elected, and a vote of thanks passed to the Rev. W. F. Keeling.

A Special Meeting was held at Cornhill and its neighbourhood on the 17th and 18th of July. Heavy rain prevented the programme for the 19th being carried out. On the morning of the 17th the party of about fifteen drove from Cornhill by way of Pallinsburn and Ford to a spot near Roughting Linn. On approaching the lofty grey sandstone ridges near Ford Moss the conveyances were left, and a walk of three miles taken over the rough moorland. On the road a halt was made at Pallinsburn to visit that well-known resort of the Black-headed Gull for breeding purposes. The members were greatly surprised to find this almost classic spot close to the highway, and only separated from it a few yards by a low railing convenient for anyone to cross, and a little wicket gate led from the road to a walk along the side of this "large pond," for it scarcely attained the dimensions of a lake. The ponds and bogs of this district are accumulations of water, etc., from the elevated irregular mounds of drift covering the south side of the Tweed, without any well-marked outlet such as Learmouth Bog—now, alas, perfectly drained, and a few other bogs and ponds hard by. The gamekeeper met us as we entered the wicket, and enabled us by his presence to approach closer to the pond or lake than otherwise we should have ventured. About two hundred Black-headed Gulls, young and old, were making a terrible noise overhead as we approached to the margin, no doubt some of their young being still unable to fly. Seven or eight broods of Wild Ducks, now well feathered, swam complacently across the far side of the lake, showing themselves occasionally along the little lanes of water that led to their retreats. Numberless Bald Coot came almost close to us, busy diving down to the bottom, and bringing up water plants to eat at the surface. A few little islets in the centre, and the margins all round this remarkable pond were covered with true Bulrush, *Veronica anagallis* and other interesting water plants. We were informed by the gamekeeper that the Black-headed Gulls had deserted this, their favourite breeding place, for a few years, on account of the abundance of water, which had covered their usual breeding ground; but they had happily now returned.

No doubt the great extent of arable land has much attraction for these Gulls, as they follow the plough and pick up, with greater avidity than the Rook, all sorts of worms and grubs. In North Lincolnshire this bird is carefully protected by farmers and gamekeepers, is more numerous than the Rook, and breeds in immense numbers in the Rabbit warrens wherever there is a shallow pool. The most painful ornithological sight I remember seeing was on the gable end of an outhouse at Nunwick, North Tyne. Thousands of these valuable birds had been recklessly shot, when they were doing all the good they could to the landowner and farmer by cleaning his land without pay, and had been ignominiously nailed in regular, close rows, horrible sight, from the top to the bottom of the gable end of the building. I do not believe they suck eggs. Close to their breeding place I have seen nests of Snipe, Curlew, Golden and Green Plovers, and Grouse, and I have never once seen them poaching the moors in organized gangs as you may see the Rooks doing any Whitsun week.

On crossing the moors to Roughting Linn we observed several concentric circles on the bare sandstone rocks fast becoming obliterated; and far off we could see the celebrated stone inscribed with concentric circles, a true *roche moutonnée*, the circles on which have been discoursed upon by the late Mr. John C. Langlands, Dr. Johnston, Mr. Greenwell, Mr. G. Tate, and others. At Roughting Linn the party sought long and laboriously for a sight of the *Royal-fern*, but in vain. The place that knew it, etc., etc. The bog at the head of the burn and its feeder is now well drained, and the natural wood which stood in its centre, so graphically described by Dr. Johnston, "Natural History, Eastern Border," Vol. I., is represented by an old Birk or two. The drains here are deep and effective. In a succession of dry seasons they would be more effective still, as the grass and ling would be all destroyed; but we saw plenty of the Sweet Gale (*Myrica Gale*), and the Petty Whin (*Genista anglica*) was abundant; and close to the Inscribed Rock very large specimens of the Adder's Tongue were plentiful. The Inscribed Rock itself was to us a failure; one side had been taken away by quarrymen for farm purposes,

and the circles on the other side were fast becoming obliterated by wind and rain and frost. It was evident that these circles must have been covered up from the very time they were made, whatever the agency, and that in a few years they will all have disappeared. This spot has been so well described by members of the Berwickshire Club, that reference must be made to their Transactions.

Regaining our conveyance at the pits, we visited the village and castle of Ford. Those who liked interiors went inside, the rest were invited by the gardener to walk round it, which they did, and admired the evergreens not destroyed, and the view of Flodden, and the White Peacock with the hen *sitting* on her nest close to the path. Thence to Etal, the only place where more than a cup of cold water could be obtained all day. This model village appears to be rather overpraised. The majestic ruin of the old Castle, to the south, close to Till, covered with Ivy partially destroyed by last winter's frost, was the most picturesque bit of masonry seen during our Cornhill visit. An ugly shaped, barn-looking place was pointed out to us as the Kirk, close to the old ruin, and sadly out of place and keeping with the other surroundings. In the evening we sauntered by the banks of the Tweed; admired the acres of Ox-eye Daisies, with discs the size of a crown piece or larger, crossed the Tweed bridge, strolled through Coldstream, knew we were far from smoky Tyne by the swarms of bats that flitted on leathery wings overhead, and, regaining our Inn, prepared "for fresh fields and pastures new" on the morrow.

On the second day we started early for Bowmont Water and Yetholm, Roxboroughshire. Some of the party desiring to see Learmouth Bog, we turned aside from our direct course. We found the bog had been thoroughly drained, and the rare Marsh Fern (*Lastræa thelypteris*) which formerly grew here, and several other rare bog plants, had been completely destroyed. Peat, Rabbits, Sheep, and Kye, one old *Aller*, and a few plants trying to live on were all that we could see. We crossed the border here without difficulty. We did not require to be told that we were in Scotland, for the exaction of a Scotch body, who demanded

"twa shillin'" for toll, impressed the fact upon us feelingly. The whole of this district is so excellently cultivated, that the only chance of finding a wild flower is by the roadside; so perfectly in contrast is it to the moors we walked over yesterday. But as we drove along someone exclaimed, "What beautiful Forget-me-nots." A halt was immediately made, and the plant on examination turned out to be *Anchusa sempervirens*, a plant by no means common in the North, though there are several localities given for it in our own district. This take satisfied the botanists, and was the chief floral discovery of the day. Arriving at Town Yetholme through narrow roads, well fenced with hedgerows, for there are no walls here to offend the eye, a rest was proclaimed for the horses, as the valley beyond was without Inns. The conveyances resumed, the valley was followed for five miles till the Bowmont turns suddenly east. At this late season the Hawthorn and Broom were still both in full luxurious flower. Silver and gold side by side, and the purple Foxglove along the margin of the stream contrasted with the earlier flowering plants. Some of the party who ascended the hills obtained a good view into the neighbouring valley. The uniform greenness of the hills was refreshing to the eyes, and the little sparkling Bowmont went plodding along as if on important business; but the hills here are so well covered with grass, that the quantity of earthy matter brought down, even after winter storms, must be comparatively small. On our way home we called at Kirk Yetholme to see the Gypsy Queen. The Church or Kirk, built out of black pitchstone porphyry, may last as long as the hills, but did not look comely or inviting. The thatch-covered cottages would have been a treasure to a cryptomatic botanist, for they were covered all over with mosses. The queen lives in a neat little cottage, was of great age, and as genuine a Scotchwoman as could be found between Maidenkirk and John o' Groats. The wet weather on the Saturday prevented our programme being fully carried out; but several of the members returned home by Branxton Moor and Wooler, the rest by Berwick.

The Fourth Field Meeting was held at Bedburn on the 4th of August. The party was joined at Bishop Auckland by the President, Mr. Joseph Duff, and a few members of the Bishop Auckland Naturalists' Field Club, and after breakfast proceeded by way of Etherley, Toft Hill, and Hamsterley towards the Bedburn, a tributary of the Wear, which was reached about noon, when the party scattered to botanize up the valley. Numerous interesting ferns and other plants were gathered, the principal novelty being the Broom Rape (*Orobanche major*), not hitherto noticed in this part of Durham. The Oak and Beech Ferns were very abundant. The outcrop of the Whindyke, known as the Beechburn or Hett Whindyke, was pointed out by the President of the Bishop Auckland Field Club. The most remarkable feature of the Bedburn is the depth to which its bed has been cut through very solid sandstone, of the Millstone Grit series, in many parts of its course. The valley terraces formed out of large accumulations of gravel on the south side of the stream were numerous and well marked.

After leaving the valley by way of Cradlebank, the party, by invitation of Mr. Windas, of Witton-le-Wear, visited his magnificent collection of ferns, than which there are few local collections more deserving of notice, and which was a rich treat to the visitors. After dinner at Bishop Auckland Mr. Soutter gave a list of the more interesting plants observed during the day's excursion, and a vote of thanks was heartily accorded to the President and members of the Bishop Auckland Naturalists' Club.

The Fifth Meeting of the year was held at Blanchland and Benfieldside on the 5th of September. About fifty ladies and gentlemen mustered at Benfieldside Station and were driven thence to Blanchland, passing through Edmond Byers to the upper valley of the Derwent. Having arrived at the secluded and ancient village of Blanchland, the Rev. G. M. Gurley, the Vicar, received them and conducted them over the curious and venerable Parish Church, and the Rev. W. Featherstonhaugh gave an interesting account of the early history of the place, which was settled by Præmonstratensian Canons from Melrose in A.D. 1165. It was difficult to say whether any part of the

original stone building of so early a date remained, though probably it existed in the chancel and remains of the nave. At any rate there was no trace of an earlier stone building, and probably the first structure was a temporary one of wood, and the lower portions of the present buildings not much later. The conventual buildings are now used as the Lord Crewe's Arms Inn, and were the famous seat of the Forsters, who lost their possessions after the rising in 1715. In the garden of the Inn the old cloisters can easily be traced. Thanks having been accorded to the Rev. G. M. Gurley, the Rev. W. Featherstonhaugh, and to John F. Spence, the party walked through the woods south of the Derwent, visited the works of the Derwent Lead Mining Company, and returned by way of Hunstanworth to dine at Blanchland. Mr. T. Thompson exhibited a young Hawfinch, which had killed itself against a window at Gibside, the first instance on record of the Hawfinch breeding in Durham or Northumberland.

The Sixth and Final Field Meeting was held on 24th of September, winding up at our old and favourite trysting place, Marsden Rock. Leaving the train at Hebburn, a visit under the guidance of Mr. J. Hunter was paid to the Hebburn Quarry, where many specimens of boulders on the top of the sandstone and ice-scratched rocks *in situ* were noticed; and fine fossil plants had been exposed in the quarry. Thence Bede's Burn was followed and Bede's Well, now in a pitiably neglected condition, but which it is hoped will soon be fenced in and cared for, out of reverence to the memory of the grand old Saxon saint. Thence the party proceeded to visit St. Paul's Church, Jarrow, which was shewn by the Rev. E. Liddell, and is remarkable as one of the oldest religious edifices existing in England, dating undoubtedly from the period of the Heptarchy. The chancel and tower have been well preserved with all their original features. Thence the party proceeded to South Shields, and inspected the remarkable Roman remains preserved in the Public Library, especially the unique Aramaic sepulchral inscription, the only record in the ancient language of Syria ever exhumed in Western Europe.

The Roman Camp at the Lawe was next visited, when we had the satisfaction of seeing that these fine historical remains are being carefully walled in by the authorities, and will it is hoped be protected from further vandalism. The members then walked through a pouring rain to Marsden, where, under the guidance of Mr. J. Daglish, viewer to the Whitburn Coal Company, they inspected the bone deposits recently discovered in old, sea-formed caves at the Lizards, and after tea in the Marine Grotto, a most interesting paper, which forms part of the last volume of our Transactions, was read by Mr. Howse on the Bone Caverns of the Lizards.

There have been no Evening Meetings this year, owing, I am sorry to say, to the absence of papers to warrant them. And we also as a Club have to express our thankfulness to the good Providence, which, during a trying and severe season, enables your President to announce that there is no obituary notice of a member since our ranks have been unthinned by death.

It will be seen from the outline of our excursions which I have briefly given that the Club cannot claim to have added much either to general or individual natural research by its excursions in the past year. An exceptionally unpropitious season has damped and checked the ardour of botanical or entomological investigation, and the attention of our members on their holidays has been rather directed to archæological and ecclesiological objects of interest than to the products of nature. Yet we must allow that here if anywhere art and nature harmonize; the Lichen, the Moss, and the Spleenwort are in perfect keeping with the Norman peel-tower whose chinks they decorate; and we naturalists do not despise archæology. In fact as the ground of the two counties becomes more and more trodden and familiar, its botanical and zoological interest must be soon completely exhausted, so far as discovery is concerned; not indeed as regards its educational power for the young naturalist. While at the same time on this border land we can scarce set down a foot on a spot which is not redolent of history, nay, which is not a stratified historical deposit, which has been two thousand years in

course of formation, and where Cymri, Roman, Pict, Saxon, Dane, and Norseman have not left their traces under or over the sod, while the hill sides seem everywhere to re-echo the ballads and war-cries of the subsequent border warfare of centuries. We, like our elder sister, the Berwickshire, have tacitly begun to incorporate antiquarian with natural history research. And how happily they can be blended no one has shown better than one of my gifted predecessors in this chair, in his Presidential Address, the Rev. G. Rome Hall.

If from our own homely excursions we turn our eyes afield to the exploration of the regions beyond our domestic limits we shall find less startling discoveries, less sensational announcements of victories won over hitherto untrodden space, than in most immediately preceding years. It was time indeed for the geographical naturalist to pause and take breath, and to endeavour to consolidate for a while the mass of new information so rapidly displayed before his eyes, but scarcely yet grasped. In Africa, especially, where the most rapid geographical conquests have recently been made, there has been a temporary pause, though no retrograde movement. One most important experiment, which promises great results, has recently been launched, chiefly through the sagacious patronage of the King of the Belgians, the introduction of the Indian Elephant, and the attempt to utilize the native African Elephant. We are all familiar with the fact that the chief obstacle in the way of penetrating the interior of that vast continent has been the absence of all beasts of burden, and the fearful waste of power and life in the exclusive employment of human carriers. No negro, save when taught by the Dutch in the south to use the bullock, has ever thought of utilizing the carrying power of any animal. If once the countless heads of African Elephants can be put to a better use than mere slaughter for the sake of their tusks, the advance will be not less than from the pack-horse to the railway. Already it has been proved that the African Elephant is not less docile or sagacious than his Indian cousin. It may seem at first sight a small matter, yet I venture to believe that this promising experiment is the most important geographical and natural history feature of the past

year. Meantime roads or rather lines of communication are being established. The Church Missionary Society has already made good its station at Uganda, on the further shore of the Victoria Nyanza, while the Livingstonian Mission is doing the same on the Tanganyika, and the half-way house at Mpapwa, established by the Church Missionary Society, bids fair to become a great central station for the interior commercial routes of Eastern Africa. Our great Missionary Societies are thus demonstrating to the world the sisterhood of Christianity, commerce, and civilization, and are striving not unsuccessfully to outstrip the two imported curses of Africa, the Arab slave hunter and the rum trader.

Turning from the Tropics towards the Pole the great geographical event of the year has been the accomplishment, after efforts fitfully continued for four hundred years, of the north east passage from the White Sea through Behring's Straits, by the noble Swedish professor, Nordenskjöld. The early Dutch navigators towards the end of the fifteenth century, with appliances which seem contemptible to the modern navigator, nearly accomplished the feat, but the discovery of America, of the Cape Route, and of the New Worlds of the Indian and Pacific Oceans, seem to have caused Northern Asia to be forgotten for two hundred years. How far the exploit may open out new routes for trade is still a problem, but even if the whole course, especially towards Behring's Straits, be rather geographically interesting than commercially profitable, the mouths of three of the greatest rivers in the world, the Obi, the Lena, and Yenesei, are proved to be accessible during the summer months, and the rivers themselves to be so far navigable, as to open out to the markets of the world a boundless corn-growing and forest region, which may yet enable Siberia to take her place, not a mere dreary prison house of despotism, but as one of the food-exporting nations of the world.*

The other principal additions to our geographical and natural history knowledge during the past year have been the explorations of several Italian travellers, and especially of Sig. d'Albertis in New Guinea, where also our Australian fellow-countrymen

* See Vol. V., p. 260.

have been doing good work. That great island remained almost the last *terra incognita* of our maps. The reproach is being rapidly removed. To us as naturalists it is peculiarly interesting, as no portion of the globe can rival it in the number, the variety, the richness, or the peculiarity of its Fauna. Probably more new species have been added to our lists from New Guinea recently than from any country within the last half century. Not the least remarkable are several new Monotremes, that lowest form of mammalian life, hitherto known only by the *Echidna* and *Ornithorhynchus* of Australia.

When from the field we turn to the closet the year has not been barren of results. Some of the carefully-worked reports of the "Challenger" have already appeared; others are in progress. The Royal Society has recently published a sumptuous quarto volume of the natural history and geology of the islands visited by the Astronomical Expeditions to observe the transit of Venus, an exhaustive and invaluable contribution to the solution of the great problem of insular faunas and floras. The Mascarene islands, once the richest, but now, alas, with every native species of animal and vegetable life either extinct or on the verge of extinction, have been thoroughly ransacked, and whatever could be put on record has been preserved for future ages. The skeletons of the long extinct didine birds of Rodriguez, now a conspicuous ornament of the bird room of the British Museum, are unique and priceless relics of a perished Fauna. Scarcely less interesting is the exhaustive report of Kerguelen's land, illustrating what forms, and with what modifications, can exist and propagate on the most dreary and inhospitable spot on the surface of the globe.

It may be perhaps permitted me, before I conclude, to make a few reflections on the changed position of the student of natural science during the twenty years which have elapsed since I had last the honour of addressing you. The study has in the interim become more and more emphatically the property of the *specialist*. A generation back many a naturalist did good work in a general way, and did much to advance science, without being in any degree a specialist. Such men were Selby, Vigors, Jardine, Sir W. Hooker, and others, whom no one would think of calling

specialists. But now it is in vain for any one to attempt either to advance physical science, or even to earn the slightest reputation, without devoting himself to some particular branch, or to some particular portion of the animal or vegetable structure. Thus the comparative anatomist must concentrate his study not on the whole framework but on some particular portion in detail. Prof. Parker has shewn what may be deduced from the careful comparison of the shoulder blade alone in Vertebrates, Prof. Huxley from the palatal bones in birds alone. Nitzsch has shewn us what problems are involved in the single question of pterylography. Others too numerous to mention, each taking their own special subject as a fundamental note, and thence modulating into other kindred keys, have borne testimony to the fact that no subject is so special as to be devoid of bearing or of influence on others. Some have described the successive stages of even a single but important experiment, and while tracing the growth of that particular item and of the ideas involved in it, have incidentally shewn to the outer world what manner of business a serious investigation is. Now I conceive that in pursuing this course the specialists have been exactly performing the function most indispensable for the establishment of natural science on a firm basis of ascertained fact. But the tendency of all scientific students is at once to generalize from facts within their own special sphere, and it seems to me that many of our current generalizations have been at the least premature, and that true wisdom would be content for the time with the establishment of facts, and leave the deductions to be drawn when the facts on the one side and the other have not only been ascertained but have been compared and balanced. For the specialist is apt to become the man of one idea, and is tempted to ignore counter-balancing and resisting forces. The force which is under his immediate cognizance he has watched, and measured, and calculated, but has he duly considered the innumerable counteracting forces which resist or bias on one side or the other the results of the one force on which his attention is fixed? Take for instance the problem of classification. This can only be solved by a judicial examination of forces all impinging in different directions. If we take

embryology alone, this has doubtless shed unsuspected light on the problem, but it is not all. Prof. Huxley was happy in his demonstration of the modification of the palatal bones in birds as a key to classification, but taken alone the system is unsatisfactory, for many other factors come in and affect the correlation of one portion of the structure to the others. Every department of the specialist supplies some indications of the true line of classification. Yet neither embryologist, pterylologist, oologist, histologist, comparative anatomist, or geographical naturalist, can, for example, in the matter of ornithological classification, say to his fellow "I have no need of thee." In the present stage of our scientific knowledge no specialist ought to venture to propound a theory which he is not at once ready to admit may be modified by the results of wholly independent investigations arrived at from a very different standpoint. But the danger of the specialist's dogmatism is that he is tempted to unlimited speculation of every thing outside his own province. I may take as an illustration of this the reckless and baseless postulates of Haeckel in what he ventures to term his History of Creation. A careful and accurate investigator of the lower forms of life and of embryology, he forms his theories, and then generalizing he postulates anything in time, and anything in space, utterly regardless of records geological or physical, and without a scintilla of proof, takes them as granted axioms, because without them he cannot form his theory of the evolutions either of man or of the lower animals. In marked contrast with these wild and visionary dreams is the modest suggestion of theories following the admission of facts of the two men who have done most in the last twenty years to found the new school of naturalists, Darwin and Wallace. As regards the former there can be no doubt of the view to which Mr. Darwin strongly inclines. Opposed as I am myself to return any other verdict than that of "non-proven" to his theory, *if carried out to the bitter end*, yet I can nowhere find in his writings any dogmatic assertions, or any claim for more than what no one can reasonably refuse, that his doctrine should be calmly weighed and tested. Take for instance the relationship of all plants and animals as springing from simple germs. But these

germs, though it is beyond our power as yet to discriminate them in their earliest stage, become more and more differentiated as they advance. And it has always appeared to me that this admitted fact gives an as yet unrefuted answer to the claim of identity, and rather proves that from the very earliest stage there must be a distinction and a difference, though our power and resources, whether chemical or microscopic, have not yet been able to detect the difference at that early stage. The growth of the germ is one of evolution or development. But do all living forms proceed from germs or organized matter, without exception, which has belonged to parents; or is there anything like spontaneous generation or the evolution of life from non-life? So far as the keenest research has hitherto reached, we may decidedly affirm, *pace* Dr. Bastian, supported by such authorities as Huxley and Tyndal, that there is not a scintilla of evidence to support the theory. We must beware of confounding knowledge and opinion. Evolution is doubtless one of the processes by which modifications of the forms of pre-existing life are brought about, but more than this I submit we cannot as scientific students state to be proved. Let us keep knowledge distinct from opinion, from theory, from subjective impressions. Still the limits of knowledge are at all times expanding, and the boundaries of the known and the unknown are never rigid or permanently fixed. Our ignorance consists partly in ignorance of actual facts, and partly also in ignorance of the possible range of ascertainable fact. If we could lay down beforehand the precise limits of possible knowledge, the problem of physical science would be half-solved already. But the question to which the scientific explorer has often to address himself is not merely whether he is able to solve this or that problem, but whether he can so far unravel the tangled threads of the matters with which he has to deal, as to weave them into a problem at all. He is not a candidate at the examination table, with a set of questions to which he might give answers, and which can all be solved. He is rather the look-out at the mast head, peering through a cloudy atmosphere, and endeavouring to trace the outline of the coast as best he can; trying to direct his vessel where

the water is open, but sometimes finding himself in a blind channel, yet nevertheless pushing onwards, and not ashamed to confess that his vision and his directions have been often at fault. Now the greatness of Darwin does not depend upon his theories, which even his warmest admirers are ready to admit are often a superstructure built on an uncertain basis of doubtfully interpreted facts, but because he has developed a new system of observation and study, which has revolutionized biology by directing attention to the general relations and the environments of plants and animals. He has led us to ask why closely allied species are seldom found together, why extinct animals are larger than living ones, why flowers are so wonderfully varied, why male birds are often so much more brilliant than their mates, and innumerable questions on the relations and variations of all creation. Perhaps that, which many years ago first directed Mr. Darwin's thoughts towards his theory, when he was exploring the Galapagos Islands, is the most important of all in its bearing on the records of creation, I mean the modifications and changes of insular faunas and floras. To the ornithologist, the botanist, or the student of the invertebrates, there is no subject more interesting or attractive than the biology of oceanic islands. This is in fact the living geological record of life on the globe. We may almost fancy we can read its chronology as we mark the greater or less divergence of island life from that of the nearest continents. Mauritius and the Seychelles tell us on the one hand of their connection both with India and Africa, and on the other of their immense antiquity, by the differentiation of every form of life. Again the comparison tells us how much longer Mauritius had been isolated from Rodriguez than from Bourbon by the greater divergence of their types. All these problems of insular and geographical distribution in connection with the development of species have come into prominence within the last twenty years. Now considering how utter was our ignorance twenty years ago as to the probable mode of the development and modification of species under varying conditions, we can hardly be surprised if scientific men have been tempted to rush into the other extreme, and to claim presumptuously an almost complete knowledge

of the whole progress of the universe from the first speck of living protoplasm to the highest development of human intellect. This practically led to materialism and to the implied denial of a God either as Creator or as a superintending Providence. But the Christian has to recognize with thankfulness a much more modest tone rapidly spreading among the scientific leaders of thought, though not yet among the scientists who ape them. In the last four meetings of the British Association the recognition that we have as yet no evidence of the natural origin of life has been most distinctly upheld, as well as the distinctions between mind and matter, between the moral and the physical. This is especially the case in regard to the theories of the origin of man. By no one has this been more ably set forth than by Mr. Wallace himself. The conclusion to which he arrives is that if man has been developed from a common ancestor with all existing apes, and by no other agencies than such as have affected their development, then he must have existed in something approaching his present form during the tertiary period, and not merely existed but predominated in numbers, wherever suitable conditions prevailed. If these continued researches in all parts of Europe and Asia fail to bring to light any proof of his presence, it will be at least a presumption that he came into existence at a much later date, and by a much more rapid process of development. In that case it is a fair argument that just as he is in his mental and moral nature, his capacities and aspirations, infinitely raised above the brutes, so his origin is due in part to *distinct and higher agencies* than such as have effected the development of the others. Then again the wonderful remains of Easter Island, proving the existence in the far remote past of the art of navigation and civilization far higher than now exists anywhere in the Pacific; the great earthworks and monuments of lost races, the predecessors of the Red Indians in North America, and of whom there was not a vestige of tradition; the wonderful symmetry and refined geodetical science exhibited in the construction of the Great Pyramid, the oldest historical building in the world;—all these tell us that human progress has not been uniform and continuous, as according to received theories it ought to be, but that there have

been long periods of partial civilization, each in turn succeeded by a period of barbarism; and this view seems supported by the occurrence of degraded types of skull, along with such as might have contained the brains of a philosopher, at a time when the mammoth and the Reindeer were inhabiting Southern France. Nowhere, as Mr. Wallace has shewn, do we find any trace of Man developing from the Ape, while we find in the Miocene remains of Europe, then enjoying a sub-tropical climate, types of every known family of the ape tribe. No, the origin of man, with his faculties, his intellect, and his soul, is a problem that neither geologic or physical research have yet solved. Revelation still stands the only key that harmoniously explains his past, his present, and his future. Here we must confess our ignorance if we will walk unguided by its light, and acknowledge "Thy way is in the sea and Thy path in the great waters, and Thy footsteps are not known." And still, whether we ramble and explore the beauties of nature on our Northumbrian hills and coasts, or whether we work in the study or the laboratory, our motto will be that of Linnæus, the great father of modern Natural History, which the President of the Zoological Society has again taken as his own. O Lord how manifold are Thy works; in wisdom hast thou made them all. The earth is full of Thy riches.

O JEHOVA
Quam ampla sunt Tua Opera!
Quam sapienter Ea fecisti!
Quam plena est Terra possessione Tua!
DAVID, PSALM ciii., 24.

The following gentlemen were elected members of the Tyneside Naturalists' Field Club during the year 1879–80:—

At the Anniversary Meeting, 1880:—Rev. Arthur Watts, Durham; Messrs. Edw. Routledge, Berry Edge; John C. Moor, Sunderland; W. J. S. Scott, C. K. McAuliffe, Newcastle-on-Tyne.

At the First Field Meeting:—Messrs. J. T. Dobson, Windsor Terrace, John Oliver, 10, Gloucester Terrace, George Kidd, James Nelson, Adamson Rhagg, John D. Walker, A. D. Murray, Charles Barkas, Newcastle-on-Tyne; S. H. Farrar, Gosforth; Edward Simpson, Chirton, North Shields; Thos. Eccles, Blyth; James Dobson, Sunderland.

At the Second Field Meeting:—Rev. H. E. Radbourne, 37, George Street, Rev. Geo. Campbell, 214, Portland Road, Messrs. J. H. Brown, jun., 19, Collingwood Street, Thos. Oliver, M.B., Eldon Square, Edward A. Hedley, 3, Saville Place, Robert Redpath, Linden Terrace, Newcastle-on-Tyne; R. L. Morton, Percy Park, Tynemouth; Rev. Thomas Calvert, Brighton.

At the Third Field Meeting:—Messrs. William Stewart, Dean Street, Septimus Oswald, 2, St. Nicholas' Buildings, Newcastle-on-Tyne.

At the Special Meeting, Cornhill:—Mr. Henry Soden Bird, 15, Grey Street, Newcastle-on-Tyne.

At the Sixth Field Meeting:—Messrs. William Yellowley, South Shields, T. B. Barker, Westoe.

The Field Meetings for 1880 were arranged to be held as follows:—

May 17th (Whit Monday)	Dipton and Devil's Water.
June 23rd (Race Week) ..	Harbottle and Rothbury.
July 5th	Berwick and Bass Rock.
August 2nd	Weardale (St. John's Chapel).
September 3rd	Barrasford, North Tyne.
October 1st	Marsden.

* It is intended to hold a Special Meeting at St. Mary's Lough, Selkirkshire, for two or three days in July.

THE TREASURER IN ACCOUNT WITH THE TYNESIDE NATURALISTS' FIELD CLUB.

FROM JANUARY 1ST TO DECEMBER 31ST, 1879.

Dr.		£	s.	d.
1879.				
Jan.	To Balance brought forward	78	13	8
	,, Subscriptions	133	0	0
	,, Sale of Transactions	4	15	6
		£216	9	2

Cr.		£	s.	d.
1879.				
	By Expenses of Meetings, sending Notices, etc.	77	5	8
	,, Engravings and Photos....	52	7	8
	,, Commission and Postage ..	8	14	5
Dec. 31.	,, Balance	78	1	5
		£216	9	2

1880, April 12.—Examined and found correct,

T. P. BARKAS, AUDITOR.

The following gentlemen were elected officers of the Club for the year 1880–81 :—

President.

Rev. A. M. Norman, M.A.

Vice-Presidents.

Robert Vint, Esq.
James Clephan, Esq.
T. W. Backhouse, Esq.
D. O. Drewett, Esq.

Ralph Carr Ellison, Esq.
Rev. J. F. Bigge, M.A.
D. Embleton, Esq., M.D.
Rev. Canon Tristram, F.R.S.
George Wailes, Esq.
Rev. A. M. Norman, M.A.
Rev. J. C. Bruce, LL.D.
Rev. A. Bethune, M.A.
E. J. J. Browell, Esq.
Rev. R. F. Wheeler, M.A.
Prof. G. S. Brady, M.D.
H. B. Brady, Esq., F.R.S.
Rev. J. E. Leefe, M.A.
Rev. G. R. Hall, M.A., F.S.A.
G. H. Philipson, Esq., M.D.
Rev. R. E. Hooppell, LL.D.

Treasurer.

Robert Y. Green.

Honorary Secretaries.

Richard Howse.
Thomas Thompson.

Committee.

John Hancock.
William Maling.
William Dinning.
John Glover.
John Philipson.
Edward C. Robson.
W. M. Wake.
T. T. Clarke.
John T. Thompson.
Joseph Blacklock.
Rev. J. M. Hick.
Rev. W. Howchin.

Auditors.

J. S. Foster.
T. P. Barkas.

II.—*Note on a hitherto undescribed Roman Camp, near Foulplay Head, Rochester, Reedwater.* By C. T. Clough, M.A., F.G.S., of H.M. Geol. Survey. With Two Plates.

The course of the western Watling Street, up to the point where it crosses the Scotch border near the "Ad Fines Camps," has been previously described by Henry Maclauchlan in his "Survey of the Roman Wall and other Remains of the North of England." In Part II. of this work, Sheet VI., is a plan of the road and the adjacent country, from a little distance below High Rochester to the Border, on the scale of two inches to a mile. On the same sheet is also an enlarged plan, on the scale of an inch to eight chains, of a camp near the Foulplay Head, and immediately on the west side of the old road. This camp is supposed to have been formed by the ninth legion.

The camp I wish at present to bring before your notice, though it lies very near to the one of which the enlarged plan is given, has yet not been put down on either of these plans. Nor is any mention made of it in the Memoir of the same Survey, though the adjacent one is described in detail, p.p. 39, 40.

In the maps of the Ordnance Survey also this camp has been equally curiously omitted. Under these circumstances, it appears worth while to send a short notice of it to this Society.

I append two plans which will briefly explain the position and shape of the camp better than it is possible by words. One on the scale of one inch to a mile, shows the course of the Roman road between Featherwood and the Border; and the other, on the scale of six inches to a mile, shows the two adjacent camps near Foulplay Head, the western one of which it is that Maclauchlan has mapped and described.

The first plan is essentially a copy from parts of the one-inch Ordnance Map, (quarter sheets 108 N.E. and 108 S.E.,) excepting that at the point where the old road makes the sharp curve near the "Ad Fines Camps," I have made a slight alteration in its course, following what seemed to me a probable site. This plan is meant to show the geographical position of the new camp, and its relation to the others in the neighbourhood.

In the second plan it will be noticed that the East or new camp lies on the Coquet side of the Reedwater and Coquetdale watershed, while the West camp, the Foulplay camp described and mapped by Maclauchlan, lies on the Reedwater side; and that consequently the range of view they command is considerably different.

The walls around them are not of quite the same shape, but in structure they appear to be very similar, and still remain about equally prominent. They show no signs of masonry, but appear to have been merely earthen walls. They are now about six yards wide at the base, and quite grassed over. At the corners where the straight sides meet they are slightly rounded. Their outer sides are the steepest, and all around them there has evidently been a ditch, excepting where the original entrances were.

In the East camp these original entrances appear to have been four in number, one in or near the middle of each of the four sides. Each of the entrances has a traverse or protecting wall about ten or twelve yards in front of and slightly overlapping it. The traverses have ditches on their outer sides, just like the main walls have.

It is instructive to notice how the hand of time shows itself, and the several places in which the walls have been cut through by small peat-sikes, etc., but there is usually no difficulty in distinguishing the openings thus made from the true entrances.

The ground inside the camp is rather smooth, and covered with coarse grass, but here and there small and rather hard-looking round or oval mounds occur, the surfaces of which seem usually to be composed of sandy soil. From their general aspect these mounds would appear to be of artificial formation.

In the north-east corner are some Whinstone quarries, in a contemporaneous bed of Basalt of Lower Carboniferous age, the position of which is given in the plan. These are evidently very old, and I would venture to suggest, as a very doubtful proposition, that it is perhaps possible these quarries may be in part of Roman age. In a few places, on the course of the Roman road between this camp and the "Outer Golden Pot," I have observed many small bits of the same variety of Whinstone, and I think

this material must have been used for making the road at some time or other, though I have not observed anything like paving stones along the road in this district. But perhaps this stone was quarried at a very much later time, when this road was used by Highland drovers, etc. Close to the "Outer Golden Pot" are other old quarries in the same bed of Whinstone. And again at the "Ad Fines Camps" there are some quarries, that seem excessively old, in a Whinstone Dyke, which runs along near the east margin of the Camps, and which is a continuation of the Basalt Dyke of Acklington.

III.—*Miscellanea.*

Occurrence of Sabine's Gull, Larus Sabini, *Leach, in the County of Durham.*—Through the kindness of my friend, Mr. Frederick Raine, I am enabled to add another rare visitant to our list of the "Birds of Northumberland and Durham."

The specimen came into the possession of Mr. Raine on the 11th of October, 1879, the same day it was shot by a fisherman at Seaham Harbour. This is the first specimen I have had the pleasure of examining. The bird is in its first plumage. The late Mr. Wm. Thompson, of Belfast, was the first to notice this beautiful species of *Larus* as a visitant to the British Isles in a communication which was read before the Linnean Society on the 15th of April, 1834. His bird was shot in Belfast Bay on the 18th of September, 1822, "Natural History of Ireland, p. 310." Although there is a very good description in the Nat. Hist. of Ireland, at p. 311, it may not be out of place to put on record a description of the plumage of our bird, which is as follows, viz.:—Bill three-quarters of an inch long from the feathers of the upper mandible, iris dark hazel, "feet pale flesh colour," claws black, crown, front of eyes, and behind the eye for one quarter of an inch white, feathers of the crown slightly tipped with pale grey, back of neck darkish grey, each feather being marked with a band of dark grey near the tips of the feathers,

which latter are white, secondaries pale grey tipped with white, primaries black on their outer webs. The inner webs have a large white oblong spot occupying the space to within about an inch of the tips of the feathers which are black. Tail, which is considerably forked, consists of twelve feathers, which are white tipped with black, with a slight touch of white at their ends. Under parts pure white, the white extending from the throat to the end of the under tail coverts.

Though only a few specimens of this species have been recorded as occurring on the East coast of England, yet according to Harting more than twenty specimens have been obtained from different parts of the British Islands since the year 1822. No doubt many individuals driven from their usual course of migration down the Labrador coast, pass to the south unobserved during the autumnal migration of the Terns and the Little Gull.

The specimen which has been stuffed by Mr. Raine, and sent to the Society for exhibition, does him much credit for the excellent manner in which it is done.

I wish also to draw the attention of our members to the beautiful groups of young, downy birds, which are also exhibited under twelve or fourteen glass shades by the same gentleman. The artistic style in which they are treated cannot be over praised.—*John Hancock*, 12*th May*, 1881.

Bird Notes during the Winter of 1880 *and* 1881.—During the late winter, almost unexampled in the memory of this generation for length and severity, for it may be said to have commenced with the first fall of snow upon the 20th of October last, and continued into April of this year. Like many others we had many feathered pensioners, which indeed became so demoralized by lengthened feeding, that a very small cover of snow sufficed to bring them back to our window.

Our guests consisted of Sparrows, Redbreasts, Hedge-Sparrows, Blackbirds, Chaffinches, the Great, the Blue, and the Cole Titmice.

It was somewhat singular that the Blackbirds were all cocks; what had become of the hens? do they migrate during the

winter, or do they succumb more easily to the severity of the weather?

The only Thrush seen was too shy to feed with the other birds and was found dead in the garden, where it had dropped from a tree, no doubt starved with hunger and cold.

A Blackbird became quite crippled, the claws of one foot being doubled under, probably its foot had been frozen; this however did not prevent it from coming as usual upon its one leg, for the other for some time was useless.

One day the Cat killed and left a Sparrow. In a very short time a Great Titmouse seized upon it, and making a hole under one of its wings, drew out and devoured its entrails; in two days it completely finished the carcass.

Some Jays also favoured us with their company occasionally; these birds are by no means scarce in the Chopwell Woods.

For the first time in fourteen years a Magpie was seen near the house; these birds are rather rare in the Derwent Valley, but they may occasionally be seen in the neighbourhood of Hamsterley and Chopwell Woods. There is little doubt that they and the Jays have suffered severely from the folly and ignorance of gamekeepers.

The winter previous to the last, the neighbourhood of the house was much frequented by a Sparrow Hawk which became very daring, and upon more than one occasion carried off a Sparrow while feeding within two yards of the window. It occasionally varied its meal by taking one of my pigeons.

Both the Blue and Cole Titmice were seen to fly away with small grains of maize with which the Pigeons were fed.

In the early winter we had Wrens but they soon disappeared and have not been seen since.

Upon the 25th of February a Thrush was heard attempting to sing, but has not been heard since; during the winter these birds appear to have almost entirely left the district.

Until two years ago Starlings were abundant, and bred freely about the house and in the trees adjoining, but recently they have been scarce; one appeared on the 26th of March as if to survey its old nesting place.

Referring to the scarcity of Thrushes, the writer was recently visiting in the South of England where the same circumstance had been noticed by the friend with whom he was staying; he stated that these birds used to be abundant in his grounds, but this spring he had not one. During the winter he picked up one in an exhausted condition, but all his endeavours failed to resuscitate it. He blamed the severe winter and their destruction to supply British poulterers.

Surely Societies like ours should make some protest against our song birds being sacrificed to please the palate of a few gourmands. Spring scarcely seems like spring without the clear sweet notes of this favourite bird.—*William Green, Thornely House, Lintz Green, May* 1*st*, 1881.

It may be mentioned in connection with the foregoing interesting note that all the smaller birds in the above list, with the addition of several Thrushes and numerous Starlings, which latter generally came in flocks of twelve or more, visited the gardens and enclosures even in the more central parts of this town during the six-months' winter of 1880–1. They came very regularly every morning during the continuance of the snow-storms and the snow in search of food. The old Blackbirds before they began to search for food displayed their pugnacity by driving away every other bird, especially young Blackbirds and Thrushes.—*Ed.*

A Statement as to recent Publications relating to Anodonta Jukesii, *by G. A. Lebour, M.A., F.G.S., Professor of Geology in the University of Durham College of Physical Science.*—In the last-issued part of the joint Transactions of the Natural History Society of Northumberland and Durham, and the Tyneside Naturalists' Field Club (Vol. VII., Part II., p. 376), there is printed a paper entitled "*Note on the Priority of Discovery of Archanodon* (*Anodon*) *Jukesii*, Forbes, *in the Lower Carboniferous Rocks of Northumberland*," by Richard Howse.

As the Societies in question have by their silence since the publication of the paper apparently sanctioned its appearance, I

feel it due to myself to bring the following points before their Members.

The paper consists of charges against me founded upon the lines now quoted:—

"In 1873 the writer found broken fragments of this shell in a bed of grit near the base of the Lower Bernician (or Carboniferous Limestone) series, near Holystone, in Northumberland. In June, 1876, more perfect specimens were obtained by Mr. Ralph Waldie, of Doddington, an intelligent quarryman, in sandstone occupying a somewhat similar position to the above, near Chillingham. The writer saw these specimens in the late Mr. Wightman's collection at Wooler a day or two after their discovery. The Holystone specimens are in the Jermyn Street Museum. The interest of this find lies in the fact that the beds which this shell characterizes in Ireland belong to the Upper Old Red or Kiltorcan series, an horizon which in the North of England has usually been paralleled with the lower portion of the Tuedian beds, sometimes known as the Upper Old Red Conglomerate. Near Chillingham *Ancdonta Jukesii* is of more elegant and elongated form than the Irish type, and occurs associated with many plant-remains."

This paragraph appeared as an Appendix to the "*Catalogue of the Hutton Collection of Fossil Plants*," published early in 1878 by the North of England Institute of Mining and Mechanical Engineers, and its only object was to call attention to the co-existence of the freshwater shell mentioned with *Ulodendron* at a certain horizon in the Lower Carboniferous Rocks of the North of England. It was in no sense regarded or meant by me as a claim to the discovery of the fossil, the interest of the matter being entirely centred upon the fact of the find and in no wise upon that of the time or manner of it. In a little book entitled "*Outlines of the Geology of Northumberland*," and published in October, 1878, I took care to give a reference to the notice of the discovery which had by that time been printed in the Transactions of the Field Club and Natural History Society, this reference being, it may be remarked in passing, but one out of six or seven made in that book to papers by Mr. R. Howse.

With regard to the paragraph as quoted above I have only to say that the date '1876' is an error—an error of no importance in a note which was not a claim of priority, but one which I deeply regret having made, since it has rendered the present explanation on my part necessary. It was, in fact, on the evening

of Race Monday, in June, 1877, that I saw the specimens of *Anodonta Jukesii* at Mr. Wightman's house at Wooler.

I may add that the fragments found near Holystone some years before were not recognized by me as belonging to *A. Jukesii* until the sight of the beautiful Wooler specimens brought them back to my memory.

As to the tone of Mr. Howse's "Note" I do not feel called upon to say one word.—*G. A. Lebour, College of Physical Science, Newcastle-on-Tyne, April 1st*, 1881.

Reply to Prof. Lebour's Statement.—As Prof. Lebour in the Statement just read by our President fully disclaims all right of priority, and admits that he did not know to what shell the Holystone fragments found by him in 1873 belonged, and that the date, 1876, given in his first paper is an error, the object I had in view in writing my last Note is fully attained.

But it is necessary to mention that my first Note on the discovery of this remarkable shell was read at our Field Meeting at Newbiggin on August 6th, 1877, and for greater publicity it was printed in the *Newcastle Journal* on the following day; previously to this no public notice had been made of the existence of this shell in the Northumbrian rocks. Had Prof. Lebour quoted this paper in his Note published eight or nine months later, in the beginning of 1878, no one could have considered his remarks as a claim of priority, but his unfortunate ignoring of this date of my paper altogether, forced me and others to consider his Note as a claim of priority. I have not, therefore, been in this matter the aggressor, but have acted strictly on the defensive.

In concluding these few words of necessary explanation I may say, that as Prof. Lebour disclaims all right of priority and objects only to the tone of my last Note, that I deeply regret if I have, in my earnestness to substantiate the truth, wounded his feelings and given him unnecessary pain, and I desire to withdraw any expressions in my paper that may seem to reflect on his character.—*Richard Howse, Newcastle-on-Tyne, May 12th*, 1881.

IV.—*Memoir of the late Thos. J. Bold.* By Joseph Wright.

As the years roll on, and we compare the earlier lists of the members of the Club with those of the present day, we become aware that the presence of many who were amongst its founders no longer remain with us. Though there is an element of sadness in the thought, yet it is not altogether so; for when we remember those who have passed away, some full of years, and others in their yet earlier manhood, and see the work they have done, as recorded in the goodly volumes of our Transactions, we have much reason for satisfaction, and not only satisfaction but a just pride in their labours, which have done so much in furthering the objects of our Club and advancing the study of Natural History in our district. It is only right and fitting that the memory of those who have so largely assisted in placing the publications of the Club in the position that they occupy should not entirely be forgotten, but rather should be kept before us as an incentive for emulation.

The following notes are an endeavour to give a short memoir of one who ever took an active interest in the welfare of the Club from its beginning, and whose name is never absent from its Transactions down to the close of his life, and to whose pen the first paper in them is due.

Thomas John Bold was born at Tanfield Lea, in the county of Durham, on the 26th of September, 1816, and was the eldest son of George Bold, a tradesman in that village. He received his early education at the school at Tanfield, under the vicar of that parish, at that time a school of great repute. The late Mr. Joshua Alder, another distinguished member of the Club, also received his education at the same place. His parents having removed to Newbottle he then attended the Kepier Grammar School at Houghton-le-Spring, and remained there until their removal to Long Benton. For a while he attended school in Newcastle; and when the time came for him to choose a trade he entered into the service of Mr. Thos. Pattinson, grocer and seedsman, in the Bigg Market, and in the service of that gentleman

and his son he remained until 1867, when he was incapacitated for active labour by an attack of paralysis.

From a youth he was of studious habits, and devoted much of his time to reading. He early turned to the study of Natural History, and at that time Ornithology was his favourite pursuit. He also gave his attention to bird-stuffing, but finding it not to agree with his health, which at this time was not strong, he soon gave it up. But though he then gave up the practical study of Ornithology he still continued to take an interest in it, and many of his earlier contributions to the *Zoologist* was on the occurrence and habits of some of the rarer birds in our district. He then turned to the study of Entomology, which he followed with enthusiasm to the end of his life, and in which he afterwards attained a foremost position. Like most beginners he started with the *Lepidoptera* but soon turned to the *Coleoptera*, which henceforward became his special study. He also gave much attention to the *Hymenoptera* and *Hemiptera*.

On his entering the service of Mr. Pattinson he came to lodge in Newcastle, visiting his parents at Long Benton regularly at each week end; and sometimes also in the long summer evenings walking out to see them. In these visits he always kept his favourite pursuits before him, and in his walks out and in to Benton always added something fresh to his collections, and also to his knowledge. These visits to home were always pleasant, for his brothers George and Edwin, though they did not devote themselves to the study of Natural History, yet in their rambles in the neighbourhood they never forgot him, and on his visits home there was always some fresh insect for him, or some new locality for those already known. In his journal these visits are noted with great pleasure. At this time also, in the long summer evenings when the day's work was over, and in the early mornings before it was begun, he followed his favourite pursuit. The banks of the Tyne, the Teams, and the Derwent, and their neighbourhood afforded him a grand hunting ground. The Ouse Burn was also a favourite spot with him. In his Journal we get pleasant glimpses of scenes that have passed away, and where

now instead of the hum of insects and the song of birds there are the busy hives of the industry of men.

On holiday times, such as Easter, Whitsuntide, and the Race Week, his wanderings were further extended, and the lake at Gosforth, and Prestwick Car became the scene of his visits. He also, as opportunity offered, explored the sea coast both northward and southward. He was thus constantly adding to his collection and also to his knowledge of the insects he collected, for he was not satisfied with merely possessing the insects, but strove to acquire a knowledge of their habits and economy. His summer holidays he usually spent with Mr. John Addison, of Banks House, Lanercost, and made admirable use of these opportunities in exploring the at that time almost unknown Entomology of the banks of the Irthing, in the neighbourhood of Lanercost, Naworth, and Gilsland. His pursuits soon brought him into contact with others of like habits, and amongst others may be mentioned Mr. Jas. Hardy, now Secretary of the Berwickshire Club, and Dr. Thomas Pigg, now of Manchester, and a former Secretary of our own Club, both of whom were ardent entomologists. He also became acquainted with Mr. John Hancock, whom he occasionally accompanied on his visits to the sea coast.

In 1843 he became a member of the Wallis Society, of which Mr. Hardy was the principal founder, and who at that time lived at Gateshead. This Society consisted of a small number of young men, who met weekly or fortnightly at each other's houses, but principally the meetings were held at Mr. Hardy's. The objects of the Society was the study of the Natural History and Antiquities of Northumberland and Durham. At those meetings papers were read and specimens exhibited and compared, followed by discussions on the papers read or specimens shewn. Amongst the objects of the Society, which Mr. Hardy says was rather ambitiously conceived, was the forming of a new Fauna of the district in some of the branches of Natural History which at that time had not been worked out. But though this scheme was not carried out, as the Wallis Society had not a lengthened life, yet the foundations were at that time laid of those catalogues with which Mr. Hardy and Mr. Bold have enriched our own

Transactions. The meetings, which as stated were held at the houses of the members, were found to be inconvenient, and the Wallis Society was dissolved. Its dissolution did not interfere with the intercourse of the members, and friendships which were there formed were not broken off. Mr. Hardy and Mr. Bold, from the oneness of their pursuits, contrived to meet once or twice a week, and to compare and examine their captures, and thus was accumulated a great mass of material, which was afterwards used in the preparation of their Catalogue of the local *Coleoptera*.

Mr. Hardy tells me that in after years Mr. Bold often recalled with great pleasure those quiet evenings, when specimens were shewn and notes compared. At that time he lodged with Mr. Balmer, a gentleman known to some of our older members, who possessed a rather fine collection of the British *Falconidæ*, and on which he prided himself very much; and often after the contents of their boxes had been examined, they would retire to the next room, and wind up the evening by an inspection of their host's collection of Falcons, for though he had given up the practical study of Ornithology yet his interest in it never ceased.

On the formation of the Tyneside Naturalists' Field Club both he and Mr. Hardy became members. Mr. Bold was unable to be present at the preliminary meeting, but he was represented by his friend Mr. Hardy. He entered into the work of the Club with his characteristic energy, and as before stated the first paper in the Transactions is from his pen.

It was one of the primary objects of the Club that correct lists of the various Natural History objects of the district should be prepared by the members. In furtherance of this object sub-committees were appointed, and Mr. Bold became a member of the Committee on Entomology, and to him and Mr. Hardy was entrusted the preparation of the Catalogue of the *Coleoptera*. And as the subject had long occupied their attention, both as members of the Wallis Society and by their continued intercourse after its dissolution, the materials they had accumulated were quickly brought into use, and the first part of their Catalogue was issued in the first part of the Transactions. The Catalogue

was begun in 1846, and the last part was published in 1852. Its publication added much to the reputation of its authors, and brought them into correspondence with the leading entomologists of the day. Of their co-operation in its preparation Mr. Hardy gives me the following note:—"Working harmoniously, the contributions to the Catalogue were pretty equally shared between us. Mr. Bold sent me the outline, with the references to Stephens' 'Illustrations and Manual,' Curtis's 'British Entomology,' Walton's 'Papers in the Annals of Natural History,' and Mulsant's writings, with his own notes on localities and other observations. These references I examined, and added others, as we had different sets of books, and filled in my own observations. Then re-wrote the whole, including the introductory observations. With respect to the gathering of material we seldom interfered with each other's collecting ground, and I believe never but once worked together in company, when we visited Prestwick Car."

The collecting grounds of Mr. Bold were the southern parts of Northumberland, on to the borders of Cumberland, with occasional visits to Marsden and Boldon Flats, and to Axwell and Gibside, in the county of Durham. Those of Mr. Hardy were the northern portion of the county of Durham, and also the northern parts of Northumberland, including the Bamboroughshire district and the neighbourhood of Wooler and the Cheviots. After the publication of their joint work Mr. Bold assiduously continued his labours and increased his collections, the results of which were recorded in the Transactions.

In 1870, nearly twenty-five years after the publication of the Catalogue, he presented to the Club a revision of it. During the period which had elapsed the number of species found in the district had increased by a third, and the nomenclature of the *Coleoptera* had undergone a revolution, necessitating a review of what had previously been done. This laborious revision, which led to the new edition of the Catalogue, was entirely the work of Mr. Bold, and it met with a most favourable reception from the leading entomologists of the day.

In Vol. I. of the Natural History Transactions is published a

list of local *Homoptera*; in Vol. III., after he was attacked with paralysis, a list of local *Aculeate Hymenoptera;* and in Vol. IV. he further enriched the Transactions by a list of local *Hemiptera–Heteroptera.* In addition to these catalogues he contributed many papers of interest, and very often a review of the insect life of the year. He was also a contributor to the "Zoologist," "Entomologist," and "Entomologist's Magazine," and kept up an extensive correspondence with the leading entomologists of the day.

In the early part of 1867 he was attacked with paralysis, by which he lost the use of his legs, and was thus incapacitated for active work; and now, he whose pursuits led him constantly into the open country, became a prisoner in his own room. But though days of infirmity had come upon him, yet they were not days in which there was no pleasure in them. For the pursuits which had been the delight of his life were now its solace in his forced imprisonment. Unable to ramble about in his accustomed haunts he never allowed himself to be idle. Fortunately his mental powers were unimpaired, and he still retained the use of his hands, and thus was enabled to work at his collections and to examine specimens which were continually sent to him by his numerous correspondents and friends.

The same method and order which characterized him in health still marked him in his retirement, and by a careful apportionment of his time he was able to attend to his collections, to keep up his correspondence, and by his reading to keep himself abreast of the entomological science of the day. It was during this period that he brought out the revised Catalogue of the *Coleoptera.* During this time he also arranged the collections of British *Coleoptera, Hymenoptera,* and *Lepidoptera* in the Museum of the Natural History Society. For twenty-five years he kept a regular Journal, in which is noted his observations on the weather, vegetation, insect life, etc. But this he ceased to keep when his affliction came upon him.

Amongst his correspondents the following names may be mentioned, which shew the estimation in which he was held by his brother entomologists, Stevens, Newman, Walcott, Wollaston,

Clark, Stainton, Rye, Dr. Power, Kirby, Bates, Crotch, Douglas, Scott, Bond, and Hislop.

In the early part of 1874 his health began to give way, and in May of that year he had an attack of bronchitis, and on the 5th of that month he died at his residence at Long Benton, and is buried in the churchyard of that village. By his death the Club lost one of its oldest and most valued members, one whose contributions to the Transactions added much to the position which they now hold in the Natural History literature of our time.

He was a careful and accurate observer, and of most unwearied industry; amply endowed with energy and perseverance, and great power of continuous working, holding persistently to his point until accuracy was attained. His complete and thorough knowledge of the subjects he made his study was such that his opinions were regarded as those of an authority. Yet he was always easy of access, and nothing gave him greater pleasure than to impart his knowledge to enquirers, and especially to new beginners. During the long period that he was confined to his room it was a great pleasure to him when his old Natural History friends visited him; and often such visits brought a gleam of sunshine, and recalled memories of many a pleasant day. Even with those at a distance, when writing became a severe task, he still delighted to keep up a correspondence.

With him has passed away another name from the roll of those eminent men who, at the formation of the Club, and by their contributions to its Transactions, had won for our district a name famous in the annals of Natural History.

Through the liberality of his brother Mr. Edwin Bold his collections were presented to the Natural History Society, and are now in their Museum at Newcastle-on-Tyne.

In preparing this Memoir I have to acknowledge the kind assistance I have received from Mr. Edwin Bold and Mr. James Hardy, both of whom I desire to accept my thanks.

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V.—*Notes on the Vertebral Column and other Remains of Loxomma Allmanni, Huxley.* By Thomas Atthey.

These osseous remains existed on nine narrow and irregular slabs of black shale, which had been worked out from the roof of the coal pit at Newsham, near Blyth, by some miners in the summer of 1870; they are the remains of part of the trunk only; the head, part of the tail, and extremities were either not present at the same place, or had not been observed.

The slabs, as taken from the mine, were brought to Mr. T. P. Barkas, of Newcastle-upon-Tyne, who described and figured the remains in his "Manual of Coal Measures Palæontology," 1873,

as those of a hitherto unknown Labyrinthodont, which he named *Macrosaurus polyspondylus*.

Mr. Barkas very kindly presented them to me in the summer of 1877, after he had taken much trouble in removing part of the shale in which the bones were imbedded. When they came into my hands they still required much care and minute work, extending over a whole month, to expose satisfactorily all their parts, and the nine fragments were reduced to three by joining those that fitted naturally together, and these three formed a continuous series.

They comprise a larger amount of the skeleton of *Loxomma* than has yet been obtained, but it is much to be regretted that the whole of the remains were not obtained, for we should then have been able to ascertain with some degree of certainty the dimensions of the different parts of the whole, probably adult, animal.

The three fragments when put in line measure fifty-six inches in length, and at no part more than eight inches and a half in breadth. Two of them are much bigger than the third, and are respectively twenty-six and twenty-four inches long, whilst the third is only six inches in length: in each case the organic remains are of the same length as the slabs in which they are imbedded.

The remains are mainly those of the vertebral column, including the whole of the dorsal and lumbar, and part of the sacral regions, if not the whole of the last, and part of the caudal extremity. The column lies crushed over slightly to its right side, the spinous and the left transverse and articular processes appearing at the left side in a long continuous series. The vertebræ, though irregularly disposed, partially distorted, and even dislocated, are, notwithstanding, found in their natural sequence throughout. Their bodies, mostly entire, are alternately large and small, both being biconcave, the smaller representing the intervertebral substances of the higher animals, and having the heads of the ribs articulated to their sides. The bodies of the larger vertebræ vary in length on their front from one quarter of an inch to seven-eighths of an inch, are strongly convex from

side to side and concave in a lesser degree from before backwards; some are broadest from side to side as in the lumbar, others from before backwards as in the dorsal region, resembling in these respects the vertebræ of the higher animals. They vary somewhat individually in dimensions, apparently according to the amount of pressure they have undergone.

The vertebræ are strongly made, their largest bodies measure, from side to side, one inch and three-quarters.

The spinous and transverse processes, visible along the whole of the dorsal and lumbar regions, are mostly dislocated, but many, whether entire or fragmentary, lie close to the centra to which they belonged. The spinous processes are broad, high, and square, the transverse are much defaced yet strong. The articular processes are in several parts distinct, and some are visibly still interlocked. The vertebral grooves have been deep and wide, and the muscles of the back and loins, so to speak, correspondingly large and powerful. The neural canal, owing to its being covered by the centra and left transverse processes, is not visible.

The number of dorsal or rib-bearing vertebræ on the slabs Nos. 1 and 2 is about fifty-six, of lumbar and pelvic on No. 2 eleven, and of caudal on No. 3 eight. The total number therefore of vertebræ present on the slabs is seventy-five.

Slab No. 1 shows thirty-four dorsal vertebræ. In connection with them are the broken remains of seven strong and well curved ribs lying obliquely to the column, some on the right, others on the left side, some beneath the vertebræ, and all directed downwards. These fragments are principally the proximal ends, some exhibiting very clearly the head, the neck, and the tubercle. The heads have been articulated as before said with the sides of the bodies of the smaller vertebræ, and the tubercles with the transverse processes of the larger vertebræ next below. The number of ribs must have been about twenty-six pairs, which may give some idea of the magnitude of the thorax.

The slab No. 2 shows thirty-three vertebræ. These are larger than those on slab No. 1, and gradually downwards assume the characters of lumbar vertebræ. The spinous processes, lying on the left side of the column, are large, broad, and

distinct, whilst on the right side are seen six or seven slender flattened ribs, the lower ends of which appear to be perfect, and are attenuated and pointed, their upper or proximal ends being rather abruptly expanded and conspicuously hollowed into as many cup-like articular cavities. They lie obliquely, their distal ends diverging somewhat from the line of the spine. The uppermost of these ribs is much broader and stronger than those below, which become more and more slender to the lowest. They are from four to six inches in length, and appear to have been free or "floating" ribs, and the articulation of the last marks the lower end of the thorax, but perhaps this Labyrinthodont had abdominal vertebral ribs.

Lying at the right side of the lower part of the lumbar region is a fragment of a flattened bone, which appears to have been articulated with the vertebral column, and may have formed part of the pelvic girdle: near the vertebræ it is rather narrow, but widens out a good deal, and the distal end is wanting.

The fragment No. 3 consists of eight caudal vertebræ; at its left side is seen one distinct, small, rounded, facet for the articulation of some small, lateral bone. The right side of this fragment has been broken off, on the other are traces of transverse processes.

On the first dorsal there is imbedded a tooth of *Loxomma*, and there is also one scute of the same associated with the vertebræ.

The length of the body of this specimen of *Loxomma* appears to have been four feet eight inches, not counting the head, neck, or tail. We know that the length of an ordinary head of *Loxomma* is thirteen to fourteen inches, and of *Anthracosaurus* nineteen inches. The neck was probably not long though strong; the tail was of unascertained length. Probably it may not be very wide of the truth if we assume the total length of this specimen to have been between ten and eleven feet. From the size and strength of its chest it had evidently been a breather of air.

From the number, form, size, and strength of the vertebræ and their processes, and of the ribs, and therefore of the chest, from the occurrence with these remains of a tooth and scute of *Loxomma*, and further, from a comparison of these bones with

those that are acknowledged to have been the bones of *Loxomma Allmanni*, I have been led to the conclusion that this specimen is really the vertebral column, etc., of the animal to which that name has been given.

It was during close and unremitting work on the above specimen that Mr. Atthey was seized by partial paralysis, which put an end to his labours, and led to his death at the end of July, 1877.—D. E.

VI.—*The Yorkshire Caves: a Three Days' Trip with the Tyneside Field Club, September* 14–16*th*, 1882. By Thomas T. Clarke.

The Trip to the Yorkshire Caves had been so often the subject of pleasant anticipation amongst the members of our Club during the preceding summer excursions, that it was with a feeling something akin to disappointment when we reckoned up our party to only eleven or twelve on getting out of the train at Darlington. This number was however increased to fifteen by some friends who had gone by an earlier train, with a view to secure accommodation. In this they were not fortunate, for when, after a walk of half-a-mile from the Ingleton Station, through the gathering gloom of an autumn evening, we arrived at the Ingleborough Arms Hotel, we were greeted by a sour hostess, who surveyed us with looks so evidently lacking in welcome, and smote us with such fierce shafts from her fell eyes, that half of our number, headed by the worthy Secretary, Mr. Thompson, turned on our heels, to seek shelter in some more humble but friendly hostel.

Seven of us succeeded in gaining ready admittance to the Wheat Sheaf Inn, where we were ministered unto by a maiden whose pleasant face would have lent a flavour to the dryest crust, and whose manner made us feel perfectly at home, as she smiled over a tray of ham and eggs and a fragrant urn of ripe, rich congou. Then we felt the full force and truth of the poet Shenstone's enthusiastic eulogy on an Inn, which our earlier

experiences at the Ingleborough had somewhat inclined us to doubt—

"Whoe'er has travelled life's dull round,
Whate'er his stages may have been,
May sigh to think he still has found
The warmest welcome at an Inn."

Thus all night the pleasant face flung sweet fancies through the brains of the sleepers, or some of them at least, for one of the number, who was perforce compelled to woo the embraces of the downy god upon a sofa which was a world too short for his proportions, declared in the morning that he had "never slept a wink," though he looked as fresh and ready for the day's work as any of us.

Rival programmes were proposed for our guidance on the trip, but feeling, with the hero of Dickens, that "discipline must be maintained," we determined to follow the route sketched out for us by the Secretaries, according to which a drive by Chapel-le-Dale to the Weathercote Cave, and the Jingle and Hurtle Pots, was to occupy the morning.

This drive, about five miles in extent, lay through the valley of the Greta, and between the rocky and broken moors of the Ingleborough hill,—which the poet Gray called "that huge monster of nature," and an older writer still "that huge creature of God,"—on the right, and the terraced slopes of Whernside on the left. By and bye, however, there was no Greta, but only a dry torrent bed, the river having, at a place called Godsbridge, played one of those pranks so common to rivers in the limestone districts, and disappeared from the daylight into the darkness beneath.

Arrived at Weathercote, admission was obtained to the Cave by applying to Mr. Metcalfe, in whose private grounds it is situated, and by a payment of one shilling each to the proprietor. The Weathercote Cave is a perfect gem, being both Cave and Waterfall combined. It is approached by a flight of rude, rough steps, leading to a depth of about one hundred and twenty feet. As you descend, the steps get rougher, and twisting about amongst damp blocks of limestone, you suddenly find yourself in

the presence of the fall. The rocks are black, the place is gloomy, the ferns, bushes, and trees meeting overhead, and imparting a strange beauty to the white rushing column of water. Reaching the bottom, encircled by a swirling shower of spray, where we could see the water swallowed up at once, and disappearing in the heaps of pebbles on which it falls, some of the more adventurous of the party got behind the fall, but had to beat a speedy retreat, so blinding was the spray and so deafening the roar of the descending torrent. We unfortunately missed the rainbow effect, which is seen for about two hours in the middle of the day, from the front of the fall. In heavy rains the streams pour in from all the slopes around the Cave, at times filling it to the brim and running over, when the water finds an outlet in what must evidently have been its natural channel but for the sudden leap underground.

We visited the Jingle Pot and Hurtle Pot, huge cavities in the rocks, a little way down the valley, connected with the subterranean stream from the Weathercote Cave. In times of flood the Jingle Pot throws up with great violence masses of stone and gravel at least thirty or forty feet from the bottom, accompanied by dismal gaspings and strange throbbing noises, and from these curious phenomena its name is derived. In the still beauty of an autumn day we of course heard nothing of all this, but in the wilder throes and turmoils of nature we could easily conceive that it must be grand to

> "See the giant crags, oh, ho!
> How they snort, and how they blow."

The Hurtle Pot, so named because in floods the water whirls so fast round that it "hurtles" out at the top, is a gloomy cavity overhung by trees, and mantled with ivy and ferns, and has at the bottom a dark pool twenty-seven feet deep, which swallows up rocks and stones, or whatever may be thrown into it, without any perceptible diminution of its depth, and is said to be honoured by being the haunt of a boggart or fairy; but, peering into the depths of the cavern, we could see only "darkness there, and nothing more." Despite this failure to find anything of the

supernatural in the Hurtle Pot, tradition has it that one evening a loving couple walking among the trees, heard unearthly noises above, such as had never been heard before, rising from the murky chasm. Surely, thought the Doves, the boggart is coming forth with some new trick, and they fled in terror from the spot. It turned out, however, to be nothing more fearful than a musical friend of Mr. Metcalfe's trying the effect of a solo on the melancholy flute by the margin of the darksome pool.

Passing below these two remarkable Pots, the stream from the Weathercote Cave follows its underground course until it emerges about a mile or more down the valley at Godsbridge. This curious fact is referred to in the chapter on Rivers in Goldsmith's History of the Earth, where he speaks "of the River Greatah in Yorkshire running underground and rising again;" and there is perhaps no place where the subterranean circulation of water may be studied to greater advantage than among the Yorkshire Caves, the mountain stream sometime plunging into a yawning chasm and anon emerging from the dark portals of a rocky cave in full current.

Further down the valley we came upon the little Chapel from which the Dale takes its name. Here we are on ground made classic by the genius of Southey in "The Doctor," in which he gives a charming word-picture of the scene worthy of the master's pen. "The little church (says Southey) called Chapel-le-Dale stands about a bowshot from the family house of the Doves. There they had all been carried to the font, there they had each led his bride to the altar, and thither they had each in his turn been borne upon the shoulders of their friends and neighbours. Earth to earth, they had been consigned there for so many generations, that half of the soil of the churchyard consisted of their remains. A hermit, who might wish his grave to be as quiet as his cell, could imagine no fitter resting place. On three sides there was an irregular low stone wall, rather to mark the limits of the sacred ground than to enclose it. On the fourth side it was bounded by the brook, whose waters proceed by a subterranean channel from Weathercote Cave. Two or three alders and rowan trees hung over the brook, and shed their leaves and seeds

into the stream. Some bushy hazels grew at intervals along the lines of the wall, and a few ash trees as the winds had sown them. To the east and west some fields adjoin it, in that state of half cultivation which gives a human character to solitude. To the south, on the other side of the brook, the common, with its limestone rocks peering everywhere above ground, extended to the foot of Ingleborough. A craggy hill, feathered with birch, sheltered it from the north. The turf of the churchyard was as soft and fine as that of the adjoining hills; it was seldom broken, so scanty was the population to which it was appropriated; scarcely a thistle or a nettle deformed it; and the few tombstones which had been placed there were now themselves half buried. The sheep came over the wall when they listed, and sometimes took shelter in the porch from the storm. Their voices and the cry of the kite wheeling above were the only sounds which were heard there, except when the single bell, which hung in its niche over the entrance, tinkled for service on the Sabbath day, or with a slower tongue gave notice that one of the children of the soil was returning to the earth from which he sprung."

The tiny Church, which will hold about eighty persons, is the only place of worship within many a mile, and is "never too small" for its congregation.

The day had been cloudy throughout, with driving showers, which precluded all hope of making the ascent of the Ingleborough hill, for when a mountain is buried in mist, with furious scuds flying across its brow, it is best to be content with the valley below. We much regretted not being able to carry out this part of our programme, for Ingleborough is by far the grandest of the Yorkshire mountains. It rises to an elevation of 2,361 feet above the sea level, and has a top so flat and spacious that an encampment of more than fifteen acres, of which traces are still visible, was established upon it, probably by the Britons. The joke in Craven is that in former times the Yorkshiremen enjoyed their favourite pastime of horse-racing on this singular level. The view from the summit is beautiful and varied, commanding Morecambe Bay and the Irish Sea, and at times the

mouths of the Mersey and the Dee are discernible, whilst the glass discloses the distant peaks of the Isle of Man. Under more favourable circumstances, at a future time, we hope to have the pleasure of making the ascent.

Returning to our conveyances, we drive back to Ingleton, with the view of the Craven District outspread in the distance. For the geologist Craven possesses a special interest, for it is intersected by what he calls a "fault," on the southern side of which the limestone strata are thrown down a thousand feet. Through a pouring rain we continue the drive to Clapham, in order to visit the Ingleborough Cave, the deepest and most remarkable of all the caves hitherto discovered in the honeycombed flanks of that remarkable hill. The walk of a mile and a half through the private grounds of Mr. Farrer, by the side of the noble lake, with grand rocky precipices above and below, would have been simply delightful, but for the constant accompaniment of "water, water everywhere," which rendered it little less than a walking shower bath; and to crown the discomfort our general guide, who had not approached the cave from that side before, misguided us up a stiff and slippery clay bank, which landed us nowhere, and we had, disconsolately, to retrace our steps. Arrived at length at the mouth of the Cave, we found that the special guide of the place was already in with another party, and we had to await his return, in the meanwhile, in a very moderate and proper way, we tried the oft-repeated experiment of keeping our spirits up by pouring spirits down.

On the appearance of the guide we were admitted into the precincts of the Cave by an iron gate, and each furnished with a candle fixed in a kind of battledore, the guide having several candles mounted on a cross-bar, and depositing our coats and umbrellas,

> "On Heaven and our Lady call,
> And enter the enchanted hall."

The cavern is in the limestone rock, and the water that flows through its passages, and lies in its silent pools, enters from the hill side above by a cavity in the mountain, known as the "Gaping Ghyll," where a small stream falls into a cave two

hundred and fifty feet deep. A few paces take us beyond the last gleam of daylight, and we are in a narrow passage, of which the sides and roof are covered with a brown incrustation, resembling gigantic clusters of petrified moss; curious mushroom-like growths hang from the roof, and throwing his light on these the guide informs us that we are passing through the "Inverted Forest." The cavern widens, and we are in the "Pillar Hall," where stalactites of all dimensions hang from the roof and stalagmites dot the floor, the one growing downwards, the other upwards, until sometimes they meet, and then the ceaseless water fashions an unbroken crystal pillar.

The stalactites occasionally take the diverse, but all-beautiful, forms of draperies, curtains, and wings, the guide strikes one of these with his stick, and it gives out a rich musical note, another has the deep boom of the cathedral bell, while yet another rings sharp and shrill. A row of leaves, when skilfully touched, answers with a gamut of notes, producing strange music in the very heart of the mountain.

Amongst the stalagmites there is one named, from its peculiar shape, the "Jockey Cap," with a circumference of ten feet, and a height of two feet, produced by a succession of drops from one single point. An attempt has been made to measure the rate of its growth, by collecting a pint of drops, and ascertaining the time it takes to gather and the amount of deposit it contains. From these data a calculation has been made, which gives two hundred and fifty-nine years as the period required to build up the Jockey Cap to its present dimensions.

Presently we came to a point at which the roof is so low as apparently to bar all further advance, but, "stooping to conquer," a distance of a few yards, done almost on hands and knees, brings us into the "Cellar Gallery" and the "Giants' Hall," where the combined lights are all too feeble to illuminate the lofty roof. At the extremity of one of the galleries a fairy structure of slender columns, composed of stalagmites and stalactites, stands and hangs in a miniature cavern, and here the guide, fixing nearly all our candles on his own cross-bar, and leaving us in a very "dim religious light," directed us to look steadily into a

small pool of water. Creeping along the low cavern, the guide then placed the full lights in the midst of the fairy structure, and lighting his pipe sent clouds of the delicious weed through and through the delicate pillars. So complete was the reproduction of the curious scene, in the still dark pool below, that our lady member, who had strictly obeyed the injunction to look into the water, without observing the proceedings of the guide, exclaimed, "Why, there is an old man below."

And here is the end, that is to all ordinary visitors, for some adventurous explorers, on one occasion, endeavouring to proceed further found a still lower cave, from which arose the sound of falling water. Letting themselves down to the lower level they were stopped by a deep pool, the receiver of the fall, and here, fixing a candle in his cap, and with a rope round his body, Mr. James Farrer swam across the murky lake, but found it closed in by what appeared to be an impassable wall of limestone. We are now, however, 700 yards from the entrance, approaching to half a mile into the heart of a hill, and we retrace our steps, occasionally stopping to express anew our admiration and astonishment at the wondrous spectacle; and, having spent more than an hour in the cave, a walk and drive under a teeming rain, back to Ingleton, scarcely sufficed in the least degree to damp the ardour of our enjoyment, which was most appropriately crowned by a comfortable dinner at the humble Wheat Sheaf Inn.

The second morning broke into glorious sunshine as we started on a five miles' drive to the Thornton Force and Yordas Cave, in the vale of Kingsdale, which is threaded by the river Doe. Leaving the conveyances by the roadside, a walk of about a mile brought us in sight of the Force, which, from the heavy rainfall of the previous day, was seen to great advantage.

The rocks on the left rise to a height of ninety feet, forming a solid wall of limestone, over which the stream, with tremendous roar and spray, dashes on the projecting strata of slate below, and glides swiftly thence into a dark and sullen pool. There are two small falls and a large one, and access to a rocky seat behind the latter is gained by following a path crossing a tiny stream on the left of the falls.

Returning by the side of the Doe, where it runs a more tranquil course, some of the disciples of the gentle Izaak Walton longed for rod and line and leisure to try the seductive powers of a fly upon its finny tribes. But, alas, it might not be—at least on the present occasion—and soon we are again in the carriages and continue our drive, with a wild open moorland on one side and grand terraced slopes of limestone rocks on the other, the whole valley flooded with the glow and glory of an autumn sun.

Yordas Cave is named after a traditional giant, whose chamber and oven are pointed out. The cave consists of two chambers; the first ninety yards long by upwards of twenty feet high; the second, circular, and rising fifty feet to its pointed roof. By the side of the second apartment is a fine cascade, a view of which is obtained by climbing upon a narrow and somewhat dangerous ledge of slippery rock. In wet weather the cave is flooded, and traces of these occasional deluges are very evident. Yordas Cave abounds in stalactites and stalagmites of the most curious forms, and, as usual, these singular productions of nature are named after the objects they are supposed to resemble. By the aid of a number of candles, fixed upon the end of a long jointed pole, a good view was obtained of the glittering and dripping roof of the fifty feet hall.

This cave hunting in mixed company occasionally affords, by the way, curious glimpses of insight into individual character. One of our members seemed to be constantly impressed with the idea, as we groped along in the dark, each with dim light in hand, that we greatly resembled a band of stage villains in search of their unhappy victims. Another was greatly concerned at the waste of water power at the falls and cascades; while a third never got beyond an interesting calculation as to which of the two inns at Ingleton would set the best dinner on the table, with minute speculation on the various dishes. It reminded one of the American illustration of Carlyle's pithy saying, "We only see what we bring eyes to see." Four men visited the Niagara Falls. One was a preacher of the more lurid type of theology; the second was a millowner; the third was a poet; and the fourth was a geologist. "What was your impression of it?"

was asked the Clergyman. "I could only think of the outpouring of God's wrath." "And what was yours, Mr. Utilitarian?" "I thought it was a shocking waste of water power." "What was yours?" was asked the Poet. "It seemed as if a million war horses were rushing down a precipice, foaming with white flowing manes." "And what was yours, Mr. Geologist?" "I calculated how fast the rock was wearing away, and how long it would take the cataract to travel up to Buffalo." Truly, we only see what we bring eyes to see.

At the Yordas Cave a considerable contingent of the party left for a walk through Deepdale to the Dent Station, in order to reach home that night, while the main body, returning to Ingleton, bade a hearty good-bye at the Wheat Sheaf Inn to "Pleasant Face," who, during our stay there, had made for us most pleasant sunshine in a shady place; and with a feeling of tender pity for those of our number who, during the same period, had been condemned to endure the sour looks of mine hostess of the more aristocratic Ingleboro' Arms Hotel, we started for a fine drive to the old town of Settle, where we were to inspect the celebrated Victoria Cave, the discovery of which, with its wonderful and instructive contents, has created so much interest amongst scientific men.

In the last century the poet Gray described Settle as "a small market town, standing directly under a rocky fell (the Castleberg); there were not above a dozen good-looking houses, and the rest were all old and low, with little wooden porticoes in front." But all this is changed now, except the situation, which is as pleasant and attractive as ever, and conveniently central for the headquarters of a tourist bent on exploring Craven and the new route northward by Carlisle. The little town of Giggleswick, within a mile of Settle, boasts of an excellent Grammar School, whose foundation dates back to the time of Edward the Sixth, and whose endowment is wealthy enough to have enabled the trustees recently to expend a sum of £20,000 in building a handsome boarding house for the elder pupils and residences for the masters. In this Grammar School the celebrated Archdeacon Paley was educated, his father having filled the office of head

master for fifty-four years. A curious object of interest in this neighbourhood is the Ebbing and Flowing Well, a spring of an intermittent character, flowing at irregular intervals into a stone basin at the roadside. A quaint old local rhyme says,

"Thence to Giggleswick most steril,
Hemm'd with shelves and rocks of peril,
Near to the way as a traveller goes,
A fine fresh spring both ebbs and flows,
Neither know the learn'd that travel,
What procures it, salt or gravel."

The poet Drayton describes the fountain as a sometime nymph with silver hair, who, flying from a satyr, was changed into a spring—

"At Giggleswick, where I a fountain can you show,
That eight hours a day is said to ebb and flow,
Who sometime was a nymph, and on the mountains high
Of Craven, whose blue heads for caps put on the sky,
Amongst the Oreads there and sylvans made abode,
(It was ere human foot upon the hills had trod)
Of all the mountain kind and since she was most fair;
It was a satyr's chance to see her silver hair
Flow loosely on her back, as up a cliff she clame,
Her beauties noting well, her features and her frame.
And after her he goes; who when she did espy,
Before him like the wind the nimble nymph did fly;
They hurry down the rocks, o'er hill and dale they drive,
To take her he doth strain, to outstrip him she doth strive.
Like one his kind that knew, and greatly feared his rape,
And to the topick gods by praying to escape,
They turned her to a spring, which as she then did pant,
When wearied with her course, her breath grew wondrous scant;
Even as the fearful nymph, then thick and short did blow,
Now made by them a spring, so doth she ebb and flow."

Modern science suggests a less poetic explanation in the syphon-like character of the channels and reservoirs of the lime-stone rock, in which the water of the well is stored. But the great attraction of Settle for us was the Victoria Cave, and, accordingly, on the evening of our arrival, we visited the Museum attached to the Giggleswick Grammar School, in which most of

the bones and many of the antiquities which have been discovered in the cave are deposited.

The cave is situated about a mile and a half from Settle, in a cliff called the King's Scaur, at an elevation of about 900 feet above the town and the river Ribble, and 1,440 feet above the sea level. The story of its discovery will be best told in the words of the discoverer himself, Mr. Joseph Jackson, of Settle. "It was," says Mr. Jackson, "in the year 1838, the year of Queen Victoria's coronation, that the cave was discovered, and it was this that led to its being called the Victoria Cave. A dog was really the first discoverer. He went into a hole of the rock and came out at another place. This roused my curiosity, and, entering with some difficulty, I found that I was in a cave, but a cave filled up nearly to the top. Creeping on, however, I found it more lofty than at the entrance. The roof was hung with stalactites, and the surface was covered with the bones of recent animals. Looking among the bones, I discovered a coin in a part of the cave where water drips in. It was plain, therefore, that the cave contained remains of the presence, not only of brutes, but of *man*. These chance finds lead to a search, and to the consequent discovery not only of bones and teeth, but of coins and other relics of human occupation. At that time we worked to a depth of two feet, and nothing in the shape of bronzes or other antiquities was found at a greater depth than this. In the year 1870 a Committee was formed, thoroughly to explore the cave, by digging and removing the contents to a depth of six feet throughout. Here we discovered many Roman antiquities. In digging a shaft near the entrance of the cave we met with bones of extinct animals at a depth of about twenty-five feet below the surface. At a greater depth than this nothing has been found. As we advanced further into the interior they were met with at a depth not exceeding fifteen feet. We have found teeth or bones of the elephant, rhinoceros, three kinds of bears, hyæna, bison, reindeer, wolf, and hippopotamus. A bone, said by high authorities to be that of a man, was found along with those of the extinct animals."* The

* The bone supposed to be human turned out to belong to a bear. See note in Mr. Boyd-Dawkins' "Early Man in Britain," p. 189. 1880.

remains of the spotted hyæna were very abundant in the cave earth, consisting of fragments of skulls, jaws, and bones, and especially of *coprolites*, which formed irregular floors, accumulated during successive occupations of the cave by that animal. One piece of this deposit, shewn to us in the Museum, broken in two, disclosed a fragment of undigested bone, embedded in the centre.

The explorations were conducted under the direction of a scientific Committee, with Sir John Lubbock as chairman, assisted by Sir Charles Lyell, Mr. Darwin, Professor Phillips, Mr. Boyd Dawkins, and others, and the expenses were met by a grant from the British Association and by public subscription. A most interesting account of the cave is given by Professor Boyd Dawkins, in his book on "Cave Hunting," pp. 81 to 125. In this work two or three very important conclusions seem to have been arrived at by the author. 1st. That the hyænas, bears, mammoths, and other animals, the bones of which had been found, had occupied the cave in pre-glacial times, and that the stratum in which their remains lie buried, was protected from the grinding of the ice sheet, which destroyed nearly all the surface accumulations in the river valleys, by the walls and roof of rock, which has since to a great extent been weathered away. 2nd. That from the position in which certain remains occurred, it is obvious that a neolithic tribe, that is, a tribe of the new or later stone age, had at one time occupied the cave, and that the date of this earlier occupation by man was about five thousand years ago; and 3rd, That reasonable grounds exist for believing that the cave was inhabited by man during the fifth century, or afterwards, at a time when the withdrawal of the Roman Legions had left the colony of Britain a prey to barbarian invaders.

It is quite impossible, within any reasonable limits, to give the arguments on which these conclusions are based.

Mr. Boyd Dawkins thus concludes his account:—"The exploration of the Victoria Cave, which has hitherto yielded such interesting evidence of three district occupations, first by hyænas, then by neolithic men, and lastly by the Brit-Welsh, is by no

means complete. The cave itself is of unknown depth and extent, and the mere removal of so much earth and clay as it is known to contain will be a labour of years. The results of the exploration to the present time (1874) are of almost equal value to the archæologist, to the historian, and to the geologist, and prove how close is the bond of union between three branches of human thought, which at first sight appear remote from each other."

That the historian has not been slow to avail himself of these results is evidenced by the Rev. Dr. Green in his last work, "The Making of England," in which the following eloquent passage occurs. Writing of the conquests of the Engle in the northern counties he says, "If history tells us nothing of the victories that laid this great district at the feet of its conquerors, the spade of the archæologist has done somewhat to reveal the ruin and misery of the conquered people. The caves of the Yorkshire moorlands preserve traces of the miserable fugitives who fled to them for shelter. Such a cave opens on the side of a lonely ravine beside Settle. In primal ages it had been a haunt of hyænas, who dragged thither the mammoth, the reindeer, the bison, and the bear, that prowled in the neighbouring glens. At a later time it became a home for savages, whose stone adzes, flint knives, and bone harpoons are still embedded in its floor. But these, too, vanished in their turn, and this haunt of primitive man lay lonely and undisturbed till the sword of the English invaders drove the Roman provincials for shelter to the moors. The hurry of their flight may be gathered from the relics their cave life has left behind it. There was clearly little time to do more than to drive off the cattle, the swine, the goats, whose bones lie scattered round the hearth-fire, at the mouth of the cave, where they served the wretched fugitives for food. The women must have buckled hastily their brooches of bronze, or parti-coloured enamel, the peculiar workmanship of Celtic Britain, and snatched up a few household implements, as they hurried away. The men, no doubt, girded on as hastily the swords, whose dainty hilts of ivory and bronze still remain to tell their doom, and hiding in their breasts what money the

house contained, from coins of Trajan to the wretched 'minims' that told of the Empire's decay, mounted their horses to protect their flight. At nightfall all were crouching beneath the dripping roof of the cave, or round the fire that was blazing at its mouth; and a long suffering began, in which the fugitives lost year by year the memory of the civilization from which they came. A few charred bones show how hunger drove them to slay their horses for food. Reddened pebbles mark the hour when the new vessels they wrought were too weak to stand the fire, and their meal was cooked by dropping heated stones into the pot. A time seems to have come when their very spindles were exhausted, and the women who wove in that dark retreat made spindle whorles as they could from the bones that lay about them."

Besides the invasion of the Engles, referred to by Dr. Green, the British inhabitants of the northern counties were subject to the incessant attacks of the Picts and Scots, whose raids, on the withdrawal of the Roman Legions, were organised on a large scale, and in the pages of Gildas we have a melancholy picture of these results. In the letter written to the Roman commander in Gaul, in 446, the Britains are described as sheep and the Picts and Scots as wolves. "The barbarians drive us back to the sea, and the sea drives us back again to perish at the hands of the barbarians," are the words put into the mouths of the embassy. Moved by despair, the British in the following year take up arms, leave their houses and lands, and, taking shelter in mountains, forests, and caves, succeed for a time in driving back their Pictish and Scottish enemies. In these, the times of their extremity, the inhabitants, no doubt, found welcome shelter in the huge Yorkshire caverns which we have been endeavouring to describe; and it would probably be during some such occupation that the articles found in the Victoria Cave were deposited.

The actual visit to the Victoria Cave itself was made by our party in very diminished numbers, the third morning finding many of our members on the wing for other parts of the country, and, although made under the most favourable circumstances, the morning sun being bright and warm, the mountain air buoyant

and bracing, the scenery around picturesque and beautiful, the visit to the cave, apart from its historical interest, was somewhat of a disappointment. Its condition, owing to the excavations, the dampness of the sticky clay floor, added to our want of lights, was not such as to invite extensive exploration, but it is desirable we should know something of it, and I am indebted to the Guide Book for the following description:—At the opening the cave is nearly one hundred feet in width, and is now about thirty-two feet in height. Chamber D is distinguished by a dome, which rises as a kind of architectural feature above the rest of the cave. In this chamber were found bones in great number and variety, two hundred and sixty-nine specimens having been classified by Professor Busk in 1875. The Birkbeck Gallery (so named after Dr. Birkbeck, the founder of Mechanics' Institutions, who was born in Settle) extends to a distance of one hundred and twelve feet from this dome. The gallery is full of holes and drops, which make it no easy work to proceed to the extremity. A glassy moist stalactite covers the walls. Returning from the Birkbeck Gallery, we enter Chamber B, which is the finest in the cave. This chamber is, with A, upon the left as you enter. Water lies in the bottom, where a shaft was sunk from above, to a depth of twenty-five feet. The stalagmite in this chamber is six feet in thickness. Chambers A and B were the dwelling-places of the human inhabitants who, in historic times, took shelter and refuge in this strange retreat. Fancy can picture the unhappy refugees, with the relics of their civilization about them; hiding from the barbarian invader in these gloomy caverns, crouching by their wretched fires, and feeding upon the flesh of their threatened flocks and herds.

The views opened out, and the thoughts suggested, by even a cursory examination of the contents of these caves, as to the conditions of man's existence, and his relations with the lower animals, wild and domestic, both in historic and prehistoric times, are well calculated to fascinate the minds of all those who delight in glancing down the vistas of remote ages, thus illuminated, not by abstract speculations, but by undeniable evidences found in the dark recesses of the mountain and the rock; and

as the history of cave exploration in Europe shews that the additions to our knowledge of the past, acquired by its means, have been neither few nor insignificant, nor in one line of enquiry only, so a wide and rich field of investigation still lies before the cave hunter in eastern countries, by a careful examination of which, he may yet hope to recover from the grasp of oblivion some further knowledge of the infancy and early culture of mankind, in the very birthplace and pathway of the nations.

O yet we trust that somehow good
  Will be the final goal of ill,
  To pangs of nature, sins of will,
Defects of doubt, and taints of blood;

The wish, that of the living whole,
  No life may fail beyond the grave,
  Derives it not from what we have
The likest God within the soul?

Are God and Nature then at strife,
  That Nature lends such evil dreams?
  So careful of the type she seems,
So careless of the single life.

So careful of the type? but no,
  From scarped cliff and quarried stone,
  She cries, "A thousand types are gone,
"I care for nothing, all shall go.

"Thou makest thine appeal to me,
  "I bring to life, I bring to death;
  "The spirit does but mean the breath;
"I know no more," and he, shall he,

Man her last work, who seemed so fair,
  Such splendid purpose in his eyes,
  Who rolled the psalm to wintry skies,
Who built him fanes of fruitless prayer,

Who trusted God was love indeed,
  And love Creation's final law—
  Tho' Nature, red in tooth and claw—
With ravine shriek'd against his creed—

Who loved, who suffered countless ills,
Who battled for the True, the Just,
Be blown about the desert dust,
Or sealed within the iron hills?

No more? A monster then, a dream,
A discord. Dragons of the prime,
That tare each other in their slime,
Were mellow music matched with him.

O life as futile, then as frail,
O for thy voice to soothe and bless!
What hope of answer or redress?
Behind the veil, behind the veil.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ BY THE PRESIDENT, REV. A. M. NORMAN, M.A., D.C.L., F.L.S., ETC., AT THE THIRTY-FIFTH ANNIVERSARY MEETING, HELD IN THE MUSEUM OF THE NATURAL HISTORY SOCIETY, NEWCASTLE-UPON-TYNE, ON FRIDAY, MAY 27TH, 1881.

Ladies and Gentlemen,—On bringing to a close my tenure of the office of President of the Tyneside Naturalists' Field Club I purpose to address you on two subjects. First, I shall, in accordance with precedent, place on record the proceedings of the Club during the past year; and secondly, I hope to give a brief sketch of some part of our present knowledge with respect to the Abyss of the Ocean.*

PART I.—PROCEEDINGS OF THE CLUB.

Our First Field Meeting was held at Dilston and the Devil's Water, on Whit Monday, June 6th. The day being a holiday, and the weather remarkably fine, about one hundred members and friends alighted at Corbridge. Most of the party visited the old Castle of the Derwentwaters, and then wended their way

* The second part only of the Address was read.

along shady paths to the banks of the stream, which they followed for several miles. The rest proceeded along the railway to the bridge across the burn. A search was made for a small mollusk which Mr. Howse had found thirty years before inhabiting some ivy-covered stone walls close by, and we had the satisfaction of discovering that it was still breeding in the old habitat. The shell is one of our small land Snails, *Vertigo pusilla*, which is a rare local species. Passing the old mill the bed of the romantic burn was followed. Here a nest of the common Wren was artfully concealed among ivy-clad sandstone rocks, and an exciting chase after a fine Water Rat enlivened the scientific proceedings of the little party. Above the mill a perfectly horizontal stratum of limestone, Fell Top, forms the bed of the stream for some distance. It is filled with stems of a large Encrinite and many other interesting fossils. As we ascended the stream the lower members of the Millstone Grit were visible in section where the stream cuts the banks, till at a fine bend in the river, known as Swallowships, a deep gorge having been cut through a bed of coarse sandstone of great thickness, affords a passage for the stream. A little south of Swallowships the lower beds of the Coal Measures are brought in by an east and west fault, which has thrown down the Millstone Grit to the south.

All the early spring flowers were in full bloom, and much time was spent in admiration of the romantic banks of the burn, while some deeply coloured purple flowers of the Wood Anemone attracted much interest and attention. Swallows and Sand Martins flew constantly past, as well as that singular bird the Water Ousel, disturbed by the advanced party, who were hurrying on ahead of us. Several spring migrants were observed, including the Sandpiper, Pied Flycatcher, and Common Redstart, which had recently arrived on their breeding ground. Vipers were looked for in vain, though sunshine and situation were both inviting.

Very few of the rarer Ferns occur in this locality, but some of the members obtained specimens of the Oak Fern, once very abundant, but now becoming rare in localities accessible to tourists and pic-nic parties. Arrived at the Linnels Bridge we rested

for a time, and then slowly turned towards Hexham, the President on the way calling to apologize to Miss Hedley for the liberty we had taken in passing through her fields without leave.

The day was charming throughout, and the view from the high bank above Hexham, lit up by the evening sun, splendid.

About sixty members dined together, after which twelve new members were elected, and then a quiet walk to the Station brought our first meeting to a close.

The Second Field Meeting was at Alston, on June 23rd and 24th. About thirty ladies and gentlemen joined this excursion. The weather was rather unfavourable, but did not entirely prevent the enjoyment of our visit to this moorland and mining district. The party who came by early train, after breakfast, took conveyances from the Blue Bell Inn to within a few hundred yards of the top of Cross Fell, Mr. Purvis kindly acting as guide. After leaving Garrigill Gate the road became steep and rough, and the majority preferred walking by a short cut across the fell, where the Moss *Polytrichum septentrionale* was growing in such luxuriance and quantity in full fruit as to attract general attention, and rejoined above the circuitous mountain track. Our first plant was *Sedum villosum*, and many of the other flowers which grow in sub-alpine situations were observed. On gaining higher ground we began to breathe more freely the fine mountain air, riding or botanizing according to the state of the road, and earnestly contemplating the top of Cross Fell, which it was our object to ascend. *Saxifraga stellaris* now became abundant in every runner, and small patches of *S. hypnoides*, and two or three species of *Lycopodium* and large tufts of Parsley Fern shewed themselves among the broken rocks of the old mining works. A gleam of sunshine led us to hope that we should soon be on the top of the mountain, with the advantage of fine weather. Indeed some of the party were close to the east end of the hill when suddenly a heavy cloud from the west struck the mountain top, trailing its fleecy, drooping fringes all over us; rain began to fall; thunder to roll; and before we were well sheltered in a comfortable mining shop a heavy thunderstorm was upon us.

Two or three eager members had pushed on and actually reached the summit of the mountain, but came down wet through; others took shelter in an old shop, where for three hours we varied our positions by walking about the buildings, watching the progress of the storm, and discussing our future prospects. Between five and six the thunder ceased to bellow round the hills, the rain fell less violently, and the clouds began to disperse. The greater number advised a return home through the rain, and a general stampede began along the road towards Alston under umbrellas and waterproofs. Two or three however, unwilling to be frustrated in their object, set out under the guidance of a miner for the top of Cross Fell, which looked provokingly near. By the time we reached the "Gentleman's Well," a strong spring of water very cold even in the hottest summer day, the weather was fine overhead. Scrambling up the debris of the "Grindstone Post," which outcrops along the northern edge, we soon found ourselves on a very flat surface, of many acres in extent, in the centre of which rose a slight mound, and here the ordnance surveyors had erected, or perhaps reconstructed, a cairn to mark the summit. The view to the far west was limited by the storms that had prevailed, but below the valley of the Eden, with that river winding like a silver thread, and the Beacon Hill above Penrith and all between, were spread out at our feet.

The height of Cross Fell seems insignificant viewed from the east, as the ground rises so gradually, and it is surrounded by eminences more than two thousand feet high; but from the valley of the Eden, the abrupt escarpment of the Pennine range and the height of the Fell, nearly three thousand feet, can be better appreciated. Crossing the desolate top, which is covered all over with conical moss-hillocks, and almost destitute of vegetation, we visited the cairn which caps the little mound, supposed by the geological surveyors to represent the lowest bed of the Millstone Grit series. We took a hasty glance from the south side at the head of the Tees, now swollen with the turbid waters of the storm, and the Yorkshire hills, rising high on the south bank lower down, then we crossed over to the east end, and beginning rapidly to descend visited one of several peculiar masses

of mountain limestone, which seem to rise abruptly from an enormous deposit of peat. These masses of limestone, which are detached hills or hillocks of the 'Great Limestone' of the district, are very much broken up and covered, as limestones usually are, with short grass, which gives them a bright green appearance among the brown heath by which they are sur-surrounded, and they are thus easily recognized. *Asplenium viride*, small but plentiful, *Cystopteris fragilis* and other dwarfed ferns were abundant. On the summit of Cross Fell we did not see a single Knoutberry, *Rubus Chamæmorus*, but it grew plentifully, though not large, on the northern side of the hill. Arrived at Cashwell, the miners gave us some refreshing tea, and conveyances being in readiness we set off for Alston, and arrived just in time to obtain a fag-end dinner.

Next morning we drove to Nenthead, where, by the kind permission of Mr. Bainbridge and under Mr. Bolton's guidance, we witnessed the process of dressing and smelting the lead ore and of separating the lead from the zinc. The weather was so thick that we did not think it worth while to ascend to Kilhope Law, so we spent our time in botanizing along the road and adjoining fields. Remarkably fine specimens of *Thlaspi alpestre* were collected by the roadside.

After dinner we visited the Nent Force and the entrance to the Nent Level, the name given to a remarkable excavation made to drain the mines of the Nent Valley, which extends for miles underground, and was formerly traversed occasionally by the miners and others in a small boat. Leaving Alston early we had time on our arrival at Haltwhistle to wander through that quaint little town, and thus finished an excursion which was on the whole very enjoyable.

Our Special Meeting at North Berwick and the Bass Rock was fixed for Monday, July 12th.*

* My warm thanks are due to our Secretary, Mr. Howse, for the valuable assistance I have received from him in preparing this account of the Field Meetings, and I especially wish to mention that I was not myself present at the Bass Rock Meeting, and that the following graphic and interesting account of the Gannet's home is entirely from his pen.

For some time previously the weather had been very wet and unsettled, and consequently on the early morning of the 12th only three members met at the Central Station. Though few they determined to proceed northward, and were rewarded as they travelled onward by meeting with every encouragement to expect a bright summer's day, and in this hope they were not disappointed, for, after crossing the Border Stream, all was sunshine.

At Dunbar they changed trains, and here the small party was unexpectedly doubled by the accession of two ladies and two gentlemen; this and the splendid weather raised the hopes and spirits of the Naturalists. Another change and short detention at Drem, and then the party having shot through several cuttings of the igneous rocks of the locality found themselves strolling through and admiring the beautifully-situated town of North Berwick.

Early travelling had whetted the appetites of all, and we greatly enjoyed the comfortable breakfast which we found ready here on our arrival. Refreshed by the meal, we at once proceeded toward the coast, and, after obtaining on our way a good view of Tantallon Castle, and

> "North Berwick Law, with cone of green,
> And Bass amid the water,"

soon reached the shore and Canty Bay, about two miles distant to the south.

The geological features of this coast are most interesting. The huge cone of North Berwick Law rises to a height of about four hundred feet, and the Bass to more than three hundred. These rock-masses are formed, as the late Hugh Miller has curtly expressed it, out of "homogeneous trap," or perhaps felspathic clinkstone, and remain lonely but approximately-true standard measures of the immense amount of denudation which the valley of the Forth has undergone in former geological periods. There can be no doubt that the materials now forming these two huge isolated rocks were once a mass of boiling-hot fluid mud, which was spread over or injected among the carboniferous rocks of that

ancient epoch, when volcanic action was in full play throughout the Lothians and their neighbourhood. Many of the stratified beds on the coast line are formed of volcanic ash, which was forced up through volcanic vents, and spread over the bed of the then-existing sea. Time did not allow us to examine these beds minutely, but we could not help noticing the numerous "*inches*" or islets which stud the coast line, and which are remains of harder rock cut off from the shore by the action of the strong tides and waves that now wear and tear this rocky coast. The Island of May stood out in mid distance, and our view was bounded by the rugged coast of Fife.

Canty Bay is the only place at which boats can be obtained for landing on the Bass, the lessee of which is also the proprietor of the little inn. Mr. Downey, the present lessee, was expecting our arrival, but we so much resembled a small family party that we had taken possession of the principal room in the inn without being noticed. But on making ourselves known, he speedily had a boat ready, manned by a quiet, canny, octogenarian Charon of eighty-five summers, and two stalwart assistants. The flowing tide was rushing fast and furious on to the rocks of this rugged coast, and our boatmen kept us well in and along the coast to the south for a mile, thus enabling us to have a good view of Tantallon Castle and the coast line with its thick beds of volcanic ash. Then hoisting sail we were soon out to sea, scudding through the gulf to the Bass, a passage crossed in bygone despotic days by many a sad but manly heart. The boat was surrounded by groups, "schools," of Guillemots, Razor Bills, and Puffins, the members of each species keeping together in little flocks, and tossing about on the rough waves of the open sea. They seemed accustomed to such intruders, merely winking at us, and then quietly paddling out of the boat's way. Soon we came among the Gannets; these keep well out from the coast and near their islet home, a mass of rock, precipitous to the eye on all sides but the one which we were now fast approaching. What a sight for a novice! As we came near their rocky home the noise and number of Gannets increased continually, and the sky seemed literally alive with large white birds flying in all

directions, some of them carrying masses of sea-tangle towards the rock, others returning from the cliffs, and skimming easily over the sea-surface in search of food for their young, or of sea-weed to enlarge and protect their nests.

How tiny, by contrast, our little boat now seemed, as we began to appreciate the height of the towering and precipitous Bass, with its partially whitewashed, perpendicular walls, and watched the thousands of white-plumaged fowls moving in every direction overhead, busily intent on some domestic duty; too busy no doubt, and too much visited, to heed our approach. It was interesting to observe with what ease they rose up with their loads of seaweed; how admirably they poised themselves with outstretched wings, and tail spread and bent downwards as they approached the spot where their young were nestled; how they hung down their feet and gently alighted among crowds of young ones, closely ranged on inclined slopes which to the beholder seemed little less than perpendicular. Yet to such places the Gannets were constantly coming, feeding their young, or placing masses of sea-weed in front of them, to protect and prevent them from sliding from their slippery nesting place. Others were leaving the rock, swooping down towards the sea with the most enviable ease and unconcern, never by any chance striking or coming into contact with the thousands of other birds which were flying in every direction, avoiding all chance of collision and personal damage, and thus quietly and unconsciously satirizing the bungling evolutions and manœuvres of wiser man.

The landing place of the Bass is on the south side. As we approached it we could distinctly see the high tide level indicated on the rock by a broad band of white-shelled barnacles. Here stepping out of the boat we scrambled up some rough steps wedged out of a small gully in the hard trap-rock, and soon reached the first platform or terrace on which the ruins of the old dungeon stand. Out of the reach of the tide and spray the rock was covered over with a golden-coloured lichen, perhaps *Parmelia parietina*, growing in great plenty, and imparting a rich colour to the rock surface. Hastily we passed through the crumbling ruins of the gloomy prison walls, now tenanted

by a blackbird and her young, and every room with tall nettles, among which were plenty of the common garden snail.

The sloping surface of the Bass may be perhaps about seven acres, and is supposed to afford pasturage for thirty sheep. This it possibly would do in some seasons, but at the time of our visit the grass seemed much destroyed by the Rabbits' burrows, and by the holes made by the Gannets when preparing materials for their nests; and thus scarcely gave sufficient pasturage for more than half a dozen sheep. Bass mutton is in great esteem, and brings high prices, consequently more Bass mutton is sold in Edinburgh than the island can possibly produce. The richness of the soil, formed out of decomposed trap-rock, is no doubt owing to the constant flight of the birds across the island, and to its having been formerly tenanted by Gulls and other sea birds in greater numbers than at the present time.

There was little difficulty, and with care no danger at all, in passing from terrace to terrace up the sloping south face, when aided by some slight help from the guide now and then where the rocks were bare and slippery. The ruins of the little chapel stand on the second terrace; the walls are still left, and in them are hollowed stones, one on the right hand of the entrance and the other at the east end of the building for holy water and other religious uses of bygone days. This is said to be the oldest structure on the islet, and it would have been well for the reputation of the Bass if it had been the only building. The ruins are now being fast undermined by rabbits, which have been introduced of late. No doubt this was done to increase the profits of the lessee, but they may prove a doubtful advantage.

From the chapel our guide took us up to a point on the south-west side of the island, that we might be enabled to look down on one of the breeding places of the Gannets.

"How fearful
"And dizzy 'tis to cast one's eyes so low"

we thought as we approached the edge of the cliff, where a precipice of more than two hundred feet went sheer down below us. The sight was beyond description. The face of the rock

seemed all beplastered with lime. We could easily discern both the young Gannets, and the old ones sitting in front of or near to them on sloping shelves of the rock, where there seemed to be no footing. Here and there, on smaller ledges, Guillemots and Razor Bills were sitting on eggs or near their young; while unnumbered Gannets were conveying seaweed or food, coming and going, alighting and departing continuously.

Our guide pointed out a ledge on which a Peregrine Falcon had nested and reared her brood early in the year, some members of which our friend assured us he had had the pleasure of capturing. The ledge was situated under a beetling piece of crag, below which was a vast chasm, and how any man could attempt to reach the spot to secure the birds was more than we could understand; but our guide seemed to have more the instincts of a bird than the caution of a reflecting man, for he rushed wildly at one time over the edge of a fearful cliff in chase of a little rabbit which we had alarmed.

From the point where we were standing, and on which the Gannets used not many years ago to build their nests, but which has been in recent years quite deserted from the annoyance of too frequent visits and molestation, we proceeded in an oblique and upward direction to the grand breeding place on the eastern cliff. This is a little below the cairn of stones erected on the highest point, and close to what is called the garden terrace.

From this dizzy spot we looked down into a much larger Gannet nursery. It was also nearer to us and the top of the cliff. Many of the old birds were sitting close by on the upper edge of the cliff, but they moved quietly away on our approach, with a croak of displeasure at the intrusion. Here we were near enough to individualize the young birds as they sat demurely in their whitewashed homesteads, clad in the purest ermine. It was interesting to notice the gentle manner in which the old ones alighted near their young, who stretched out their necks to receive from them the food which had been brought home after some foraging excursion.

The view from this isolated height was very fine; the island of May a few miles distant to the north, the sea covered over

with birds, the three hundred-feet cliff beneath us swarming with Gannets, the blue sky above us filled with large birds whose clamorous noise and hoarse croakings almost deafened us, and then the view which we saw to the south, as we turned to leave this delightful spot,—the Lothians lit up by the western sun, Tantallon Castle, and the bold broken coast line—are ever to be remembered.

Our time having expired we descended to our companions, and after a short examination of some of the plants growing near the dungeon ruins embarked, and with much regret brought to a close our hurried and imperfect visit to the Bass.

Meanwhile our host and hostess had not forgotten to prepare a comfortable dinner, which was hastily enjoyed by all, as train time drawing near we were obliged to leave Canty Bay and its pleasant neighbourhood with all speed.

The great attraction and source of wealth of the Bass is the Gannet or Solan Goose, *Sula Bassana*. How long this bird has frequented this rock is entirely beyond the records of history, but from the sixteenth century downward it has been frequently mentioned by ornithologists and others who have visited the Bass in order to observe its habits. The first author, Hector Boece, among other quaint remarks concerning these birds, records the tradition that the Solan Geese were produced from Barnacles directly and spontaneously, but this mode of evolution, I need scarcely mention, is held up to ridicule by the evolutionists and others of the present day, who require more time than a few days for the processes of Natural Selection as it is called, and consider the rapid and direct evolution of a bird from a Barnacle inconsistent with the slow *modus operandi* required by the modern Evolution doctrine.

Dr. William Harvey, the discoverer of the circulation of the blood, is the next writer who describes the Bass and its colony of Solan Geese. He says, p. 208:*

"In the desert islands of the east coast of Scotland such flights of almost every kind of sea-fowl congregate, that, were I to

* The Works of William Harvey, M.D., by Robert Willis, M.D. Sydenham Society, 1847.

state what I have heard from parties very worthy of credit, I should, I fear, be held guilty of telling greater stories than they who have committed themselves in regard to the Scottish Geese, produced, as they say, from the fruits of certain trees that had fallen into the sea. These Geese the narrators themselves had never seen so produced; but I will here relate that which I have myself witnessed.

"There is a small island, which the Scots call the Bass Island, situated in the open ocean, not far from the shore, of the most abrupt and precipitous character, so that it rather resembles one huge rock or stone than an island, and indeed it is not more than a mile in circumference; the surface of this island in the months of May and June is almost completely covered with nests, eggs, and young birds, so that you can scarce find free footing anywhere; and then such is the density of the flight of the old birds above that, like a cloud, they darken the sun and the sky; and such the screaming and din that you can scarce hear the voice of one who addresses you. If you turn your eyes below, and from your lofty stance and precipice regard the sea, there you perceive on all sides around an infinite variety of different kinds of sea-fowl swimming about in pursuit of their prey! the face of the ocean is very like that of a pool in the spring season when it appears swarming with frogs. If you sail round the island and look up, you see on every ledge, and shelf, and recess, innumerable flocks of birds of almost every size and order, more numerous than the stars that appear in the unclouded moonless sky; and if you regard the flights that incessantly come and go, you may imagine that it is a mighty swarm of bees you have before you.

"I should scarcely be credited did I name the revenue which was annually derived from the feathers, the eggs, and the old nests, which, as useful for firing, are all made objects of traffic by the proprietor; the sum he mentioned to me exceeds credibility. There was this particular feature, which, as it refers to our subject, I shall mention, and also as it bears me out in my report of the multitude of the sea-fowl; the whole island appears of a brilliant white colour to those who approach it, all the cliffs look as if they consisted of the whitest chalk; the true colour of

the rock, however, is dusky and black. It is a friable white crust that is spread over all which gives the island its whiteness and splendour, a crust having the same consistency, colour, and nature as an egg shell, which plasters everything with a hard though friable and testaceous kind of covering. None of the birds are permanent occupants of the island, but visitors for the purpose of procreation only, staying there for a few weeks, in lodgings, as it were, and until their young ones can take wing along with them."

John Ray, the founder of the Royal Society, visited the Bass Rock in 1661.* He went to Leith, he narrates, keeping all along on the side of the Frith. "By the way we viewed Tontallon Castle and passed over to the Basse Island, where we saw on the rocks innumerable of the Solan Geese. The old ones are all over white, excepting the pinion or hard feathers of the wings, which are black. The upper part of the head and neck, in those that are old, is of a yellowish dun colour. They lay but one egg apiece, which is white and not very large; they are very bold and sit in great multitudes till one comes close up to them, because they are not wont to be scared or disturbed. The young ones are esteemed a choice dish in Scotland, and sold very dear (1s. 8d. plucked). We eat of them at Dunbar. They are in bigness little inferior to an ordinary Goose. The young one is upon the back black, and speckled with little white spots, under the breast and belly grey. The beak is sharp-pointed, the mouth very wide and large, the tongue very small, the eyes great, the foot hath four toes webbed together. It feeds upon Mackrel and Herring, and the flesh of the young one smells and tastes strong of these fish. The other birds which nestle in the Basse are these: the Scout, which is double-ribbed; the Cattiwake, in English Cormorant; the Scart, and a bird called the Turtle-Dove, whole footed and the feet red. There are verses which contain the names of these birds among the vulgar, two whereof are,

> The Scout, the Scart, the Cattiwake,
> The Soland Goose sits on the Lack,
> Yearly in the Spring.

* Select Remains of the learned John Ray, M.A. and F.R.S., etc., by William Derham, D.D., F.R.S. 1760.

"We saw of the Scout's eggs, which are very large and speckled. It is very dangerous to climb the rocks for the young of these fowls, and seldom a year passeth but one or other of the climbers fall down and lose their lives, as did one not long before our being there."

"The laird of this island makes a great profit yearly of the Solan Geese taken; as I remember they told us £130 sterling. The island will afford grass enough to keep thirty sheep. They make strangers that come to visit it burgesses of the Bass, by giving them to drink of the water of the well, which springs near the top of the rock, and a flower out of the garden thereby. The island is nought else but a rock, and stands off the land near a mile. We found growing in the island in great plenty *Beta marina, Lychnis marina nostras, Malva arborea marina nostras,* and *Cochlearia rotundifolia.*" In modern nomenclature, *Beta marina,* Sea Beet; *Silene maritima,* Sea Campion; *Malva arborea,* Tree or Bass Mallow; and *Cochlearia officinalis,* Scurvy Grass.

Mr. Macgillivray, who visited the island more recently, estimated the Solan Geese when he was at the Bass at twenty thousand. It has been more lately computed that about five thousand pairs of Gannets frequent the Bass annually. The breeding season is prolonged from March to September, in consequence of the birds not all arriving together, and of the robbery of their first eggs.

The nests of the Gannet are composed of seaweeds, gathered from the surface of the sea, and lined with grass and turf, which they dig up by the root from the upper part of the Bass, leaving large holes in the ground. They also pick up floating pieces of stick and other curious articles, which they find floating in the sea near the rock, such as butterscoops, india-rubber shoes, children's whips, baskets, etc. One old Gannet contrived to carry up a basket big enough to hold five beer bottles, and not being able to pull it to pieces, made her nest in it.

In Ray's and Walker's time the price of young Gannets was 1s. 8d. each. Now they are 9d. and 6d. each, and the demand is decreasing yearly. It is stated that in James the Fifth's time as many as thirty-six Gannets were ordered for the king's table,

but in these luxurious days the Gannet is not considered "a dainty dish to set before a king."

The eggs and young birds form the principal source of revenue to the lessee, who employs experienced men to go over the cliff to collect them. These men are so daring that they step about on the very edge of the cliff with the greatest ease; but at the chief takes of the eggs and the young, ropes are tied round the waist, and the men are lowered by companions standing on the cliffs above; a hand rope, which is fastened securely to some rock, is used for signalling to those above when the collector is out of sight and cannot be heard. More than two thousand five hundred eggs, chiefly of the Gannet, were taken this year, 1880, and about half as many young birds will be destroyed for the sake of their feathers, and for roasting in order to obtain the oil, which is preserved and sold as a lubricant. The roasted bodies are sold in the neighbouring towns and villages, and excursionists come to Canty Bay and regale themselves on a "Guse and a Gill."

The old birds begin to arrive in March, and continue to do so until June, but the months of May, June, and beginning of July are the proper months for incubation. Owing to the nests being often robbed some of the young are not able to fly before the end of August, and when this happens the old birds are exposed for weeks to the depredations of gunners who visit the Bass in boats and for the mere sake of killing destroy every bird that comes within range, while the half-fledged young are left to perish in their nests.

The Gannet lays only one egg, which it will proceed to incubate if not robbed or disturbed; but it would appear that most of the first eggs which are accessible are taken for commercial purposes, and that only a few of the first and early nests placed in more inaccessible places escape.

We did not notice a single Gannet in immature plumage among the thousands that were passing to and fro, and we were informed that only mature birds come to the rock to breed, and that they are not mature till the fifth or sixth year. It is to be feared that from the number of eggs and young that are taken

annually by the lessee, and the wanton injury done to old and young by gunners at the expiration of the close time, very few young have a chance of getting away. If this be the case, the number annually visiting the rock must continually decrease, unless replenished from other breeding stations. Statistics relating to these birds are very uncertain and unsatisfactory, but, compared with the accounts given by old authors, the number of Gannets visiting the Bass seems to be considerably reduced.

Another cause of the diminution in the number of Gannets is probably to be found in the great increase of steam traffic along the coast. The daily passing and repassing of large steam vessels must be a constant source of disturbance both to the birds themselves and to the shoals of young Herrings, on which they principally feed. Similar reasons would seem to account for the large decrease in the flocks of birds which frequent the Farne Islands and Flamborough Head, and it appears certain that unless further protection is extended to the interesting birds, which still make these breeding stations famous, many of them will be driven away to more distant and inaccessible places.

The weather on the following day was so unfavourable that only a short visit was paid to the lighthouse on St. Abb's Head and to the ruins of Coldingham Abbey.

The Fourth Field Meeting was a visit to St. John's, Weardale. Only nine members availed themselves of the opportunity of visiting one of the prettiest valleys in the North of England, and which for mineralogical and geological pursuits is far superior to any other in our district. The narrowness and steepness of the main valley from Frosterley to Wearhead, on the sides of which are indicated the outcrop of numerous beds of Mountain Limestone ranging in section from the Great Limestone, which is worked so extensively in the neighbourhood of Stanhope, down to the small outcrop of the Cockle Shell Band displayed in the neigbourhood of Westgate; the great extent of the lateral valleys scooped in former times out of the huge hill sides, and extending on the north side to distances of several miles, and shewing outcrops through nearly their whole extent; the extensive

quarrying carried on for limestone and ironstone; the numerous mineral veins, which can be observed in the section of the burns; and the exposure of two extensive beds of basalt by faulting and otherwise, constitute this valley a classical spot for a geologist; a model of which, reduced to a portable form, would enable many persons to comprehend several geological theories not generally understood. Inhabited by an independent, hard-working, fresh-looking mining population, which is shut out in a great measure from the effeminacy of towns, the sides of the steep hills have been cultivated nearly to their tops, and cheerful homes are scattered throughout the length of this charming valley. Here and there a leading lead vein can be traced for miles across the valley, but only one important fault, from north-east to south-west nearly, breaks the somewhat uniform continuity of the outcrop of the strata. This is the Burtree Ford Dyke, which extends from the Tyne to the Tees. By former geologists it was thought to be a basaltic dyke, since it occasionally brings up the Great Whin-Sill along its line of throw, but it is merely an extensive fault, affecting the position of the limestones and Whin-Sill by many hundred feet in parts of its course.

On alighting from the train at Stanhope our little party was conveyed in a brake to the upper part of the dale, the sides of which, with its many pleasant homesteads, could easily be seen in our course. Our driver slackened speed at Howl John that we might get a full look at the farmstead so called, where the celebrated Durham shorthorn prize-taker was born and bred. A little further on we gathered *Sedum dasyphyllum*, perhaps an outcast from a garden but now growing profusely wild in one locality. Another halt was made at East Gate to inspect Mr. Moor's collection of British Ferns obtained from this and the neighbouring dale, among these were some magnificent specimens of the Holly Fern, *Polystichum lonchitis*, with fronds twenty inches in length, which had been brought from Teesdale twenty years ago. Passing from the East Gate of the Bishop's Old Park to Westgate, we encountered a heavy shower, but this was soon over, and at West Gate we picked up our friend Mr. George Race, a Wernerian geologist, who still clings, as nearly all miners

do, to the doctrines of that celebrated German master. We now arrived at St. John's Chapel, and as soon as our friends could be refreshed started off for Wear Head and the Cow Gate. At this spot the celebrated Burtreeford Dyke crosses, and one of the most interesting and instructive sections of the mountain limestone rocks is exposed. Our friend and guide energetically contended that because the trap or basaltic rock was regularly intruded among the other beds, and had been faulted along with them, it must have had a similar origin; but the obvious reply was, that although it seemed at this spot to form a regular stratum, yet not far distant especially in Teesdale it put on a very different appearance, and since it there encloses large fragments of the other rocks and otherwise breaks them up into dislocated masses, it must have been thrust up through them at a later date than their formation.

It had been arranged to walk to St. John's, and the weather being very fine the scenery of the upper valley was much enjoyed. A late dinner at St. John's brought this day's pleasant excursion to the higher part of Weardale only too rapidly to an end.

On the morrow a prospect of fine weather enabled us to start for a short ramble up Irishope Burn on the south side of the valley. Here we climbed along a steep mountain road higher and higher, gathering such common wild sub-alpine flowers as the little runlets afforded, but detecting nothing rarer than the beautiful Grass of Parnassus. On reaching the height of nearly two thousand feet most of our companions returned, the rest pursued a devious course o'er bog and heather, stopping now and then to gather the beautiful rosy ripe fruit of the Knoutberry and enjoy its peculiar acid taste. Only two other good plants rewarded our search, *Sedum villosum* and *Saxifraga stellaris*, neither of which are so common in Weardale as in the adjoining valleys of the Tyne and Tees. A hasty repast and a rapid drive to Stanhope ended our most enjoyable visit to Weardale.

The Fifth Field Meeting was held on the 3rd of September, at Barrasford and Chollerton, North Tyne. A considerable

number of members left the North British Railway Station at Newcastle, at 11.45 A.M., and several stations which were passed added others to our party. Arrived at Barrasford we walked first to the whinstone quarries, which are being most extensively worked by a Welsh company. A very fine section of the whinstone is here exposed the rock being remarkably homogeneous and free from faults. We then began to ascend the hill behind the quarry, and gradually mounting pursued our way along the outcrop of the Whin-Sill until at Gunnar Peak we attained the highest point of the basaltic crags. The day was delightful, and the view from this point looking in all directions was remarkably fine. Immediately below us nestled the pretty little village of Gunnarton with its curious "money-hill," which consists of an ancient British earthwork and fortress. We much regretted that time did not allow us to descend and visit it, but the Rev. G. Rome Hall, who most kindly and efficiently acted as our guide throughout the day, had other interesting Romano-British remains to show us close at hand. On the southern side of the summit of Gunnarton Crags themselves and immediately below the highest peak he has found the remains of ancient buildings, which are considered by him to be indications of what was once a Romano-British town. Similar strong defensive positions exist on the summits of the great line of basaltic outcrop eastwards towards the Watling Street. He has kindly supplied us with the following information. In the process of removing the "talus" or *debris* from beneath the northern face of Gunnar Peak the quarrymen discovered numerous remains of the early inhabitants who lived in the town above during pre-historic and Roman times. Portions of skeletons and many skulls of men women and children were found, together with fragments of querns or hand mills and pottery, and also a bronze finger ring, a bead of shale, and other objects. As the ancient town was situated just above the spot where these relics were disinterred, Mr. Hall considers it probable that victims had been cast headlong dead or living from this lofty "Tarpeian Rock" on the storming of that town, perhaps by the legionaries of Agricola about A.D. 80 or 81. It was therefore deemed desirable to

make explorations in the camp itself, and this has been done with the approval of the lord of the manor, the Duke of Northumberland. Under the direction of Mr. Hall, who had previously undertaken similar explorations, and with the efficient help of Hugh Miller, Esq., F.G.S., several circular and two square or oblong dwellings have been cleared out, and their peculiar arrangements of doorways, partitions, etc., observed. Some curious and interesting relics of the British and Roman periods have been brought to light. They consist of fragments of urns and amphoræ, a perfect bronze harp-shaped fibula, a fluted iron ring, hand-mills, nails, etc. A kind of earth-oven was also examined outside the entrance of the camp and in front of its southern rampart. More extended explorations will, it is hoped, be soon made, and a full account of the discoveries published in our Transactions by Mr. Hall.

Leaving now the line of crags we made our way to Swinburne Castle the seat of J. G. Riddell, Esq., by whose kind permission we then proceeded through the extensive park to examine the numerous lines of curious geological parallel terraces and a large upright stone, regarded as a Druid monolith. This stone stands in the middle of a pasture, and has a height above the ground level of eleven feet, with a breadth of three feet six inches, and a thickness of one foot one inch. Hence a pretty walk through wood and lane brought us to St. Giles' Church at Chollerton, where we were met by the Rev. C. Bird the Vicar. The church is an interesting and ancient one, and has been thoroughly well restored. Mr. Bird shewed us freshly gathered specimens of the Maiden Pink, *Dianthus deltoides*, which used to be common on the Barrasford Crags, but is now becoming very scarce.

The afternoon was passing rapidly away, and we hurried on to Chollerford Inn, where Mrs. Reed had tea provided for us, but the accommodation was hardly sufficient for so large a party as our Club mustered on this occasion. After tea the President gave the members some account of the Expedition from which he had just returned, and made known to them some of the more interesting results which had been obtained through the dredging of the French Government steamship "*Le Travailleur*," in the

Bay of Biscay, and in which, by the invitation of the French Government, he had had the honour of taking part.

The train which left Chollerford at 8·35 P.M. brought back a cheerful party well pleased with their day's trip.

The SIXTH and last FIELD MEETING of the year was held at Marsden Rocks on Friday, October 1st. Although the party who attended this meeting was small the interest of Marsden Rocks had not ceased, and we can never gaze at that great section of contorted, twisted, and dislocated strata, without fresh feelings of wonder at the mighty power which must have been brought to bear in effecting these great changes in the beds after their deposition. There were, however, novelties in store for the members. On our way a visit was paid to the Coal Mine which is being sunk near Whitburn, and we were witnesses of the most novel form of pit sinking, in which the labour of men gives place almost entirely to the operation of machinery, and the shaft is excavated by the working under vertical pressure of an iron beam, armed with a row of wedge-shaped teeth, and made to revolve by means of horizontal levers moved by three or four men.

At Whitburn Lizard Mr. Howse called our attention to the spot on the eastern escarpment of the Hills, where an old Sea-Cave had recently been discovered, and which was found to contain very interesting remains of mammals, birds, and man, which he has recently described in our Transactions. We also examined the raised sea-beach, recently laid bare by the workings of the quarry, and the sections of clay with chalk-flints and rounded pebbles of quartz, which is known as the "Scandinavian Drift."

I may observe that we found on this occasion, what had not previously been noticed on this spot, that the surface of the rock underlying the drift was most markedly and unmistakably scored by glacial scratches.

An EVENING MEETING in connection with the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne, was held on Thursday, May 12th, 1881, when the following Papers were read:—

Note on the occurrence of Sabine's Gull, *Larus Sabini*, on the Coast of Durham, by John Hancock.

Note on a hitherto undescribed Roman Camp near Foulplay Head, Rochester, Reedwater, by C. T. Clough, M.A., F.G.S., of H.M. Geological Survey.

A Statement as to recent publications relating to *Anodonta Jukesii*, Forbes, by G. A. Lebour, M.A., F.G.S., Professor of Geology in the University College of Physical Science.

Bird Notes during the Winter 1880-81, by W. Green, Esq., Thornley House.

During the past year death has snatched from the Club some of her worthiest members.* Foremost among them we have to grieve for the loss of Mr. Thomas Atthey, a man possessed of good natural talent, a keen and observing eye and clear intellect, which made him in his pursuit of science a worthy companion of her most distinguished votaries. His father was a corver at Kenton, and there he was born in 1814. As he grew up he assisted him at his work until the old corve was superseded in the north by the "iron tub." Then, while still a young man, he went into Lancashire, where he superintended the corving at some collieries with which George Stephenson was connected. Returning from Lancashire he resided at Cramlington, to which place his father had during his absence removed. Here he started a small grocer and provision dealer's shop, which he carried on for some years. Subsequently he removed to Gosforth, and there followed the same business, and died in April, 1880. He had received but little education but he made the best use of such as he had, and carefully studied those books which came into his hands, treating of subjects congenial to to his mind. He was a born naturalist, showing a love of nature from his earliest years. Prestwick Carr, which was at that time in its original beauty, was his favourite resort. He carefully studied and became familiar with the birds and plants of the neighbourhood, and his visits to the Carr led to that

*I am indebted to Mr. Joseph Wright, who has kindly collected for me materials for the following biographies.

acquaintance with Mr. John and Mr. Albany Hancock, which was of so much value to him in after years. Another friendship which he early formed was that of Professor Oliver, now of Kew, but who at that time resided in Newcastle. It was, I am told, at the suggestion of Professor Oliver that he devoted himself to the collecting and preserving of the Diatomaceæ, and Desmidiaceæ, microscopic plants, which abounded in the ditches of the Carr. For many years he pursued these subjects, extending his investigations with respect to microscopic plants throughout the fresh and salt waters of the district. He had made preparations for the publication of a catalogue of these organisms, but in consequence of his taking up another and more important field of study, it was never completed. His early connection with collieries, and his love of natural science, had led him to search for fossils in the coal measures, and it so happened that the district in which he resided was peculiarly rich in fossil remains, and thus the latter years of his life were almost entirely devoted to the study of this branch of Palæontology. He was peculiarly fortunate, and during his investigations accumulated a large series of coal measure fossils, including many of extreme rarity. His manipulative skill was very great, and no time was thought by him too long to be bestowed in developing and clearing his beautiful specimens from their matrix, which form one of the finest collections of coal-measure fossils in the kingdom. The first paper which bears his name was written in conjunction with Mr. J. W. Kirkby, "On some Fish Remains from the Durham and Northumberland Coal-Measures," and was published in 1864 in Vol. VI. Tyneside Naturalists' Field Club Transactions. From that time his name is constantly associated with that of Mr. Albany Hancock, who until his death assisted him in the description and illustration of the choicest specimens in his collection. His still more recent papers, written subsequently to Mr. Hancock's death, were illustrated through the kind help of his friends Dr. Embleton and Mr. Dinning. Mr. Atthey became a member of the Club in 1860, and a few years before his death was made an Associate of the Linnæan Society. We may congratulate ourselves that

through the liberality of Lady Armstrong Mr. Atthey's grand collection of fossils, which includes many choice types, has been purchased and presented to the Natural History Society, in whose Museum it is now deposited.

Mr. Francis Charlton, C.E., who had accompanied us in some of our rambles during the past year, died very suddenly, at his residence, at Tynemouth, on April the 9th, 1881. He was one of the Charltons of Hesleyside, and was Surveyor for the County of Northumberland. Without devoting himself to any special branch of Natural History he took a lively and intelligent interest in it. He became a member of the Field Club in 1874, and was a frequent attender at the Field Meetings, where his general information and his special knowledge of the old county families and history always rendered him an interesting and agreeable companion.

Mr. W. M. Wake died at Sunderland, April 23rd, 1881. He was elected a member of the Club in 1860. He took an active interest in its affairs, and for many years was a member of the committee. He was an ardent student of Palæontology, and had a very good collection of Tertiary and other Fossils, including a fine series of those from the Permian beds of Tunstall and its neighbourhood. He was much interested in the Museum at Sunderland, and devoted much time and care to the arrangement of its collections.

While thus paying a tribute to the memory of those who are taken from us, I cannot but express my regret that I see so few young Naturalists rising up in the district to take their place. The Tyneside Naturalists' Field Club maintains its number of members, but unless new blood of young and ardent devotees of science is infused into it, it cannot long maintain that very high rank which it has hitherto held among scientific societies, and which has made its Transactions to be regarded as the most valuable publications of any provincial society in the kingdom. Why will not our younger members apply themselves to the attentive study and working out of some one special group of the animal or vegetable kingdoms, as those who bore the honoured names of Alder, Hancock, Hodge, Atthey,

and others have done before them, instead of being dabblers and smatterers who do nothing well. Surely, now that there is a College of Physical Science in Newcastle, we might hope to find an increase and not a decrease in the students of Natural Science. Vast fields of research in respect to the fauna and flora of our northern counties remain untrodden. No catalogue exists of the fishes of the district, yet the extensive use of trawls now employed should give most favourable opportunities of investigation in this direction. Few of the Insecta, if we except the Lepidoptera and Coleoptera, have been studied and catalogued efficiently. The Arachnida, the Myriapoda, the Annelida, the Rotifera, the Spongida, and most of the Protozoa await examination. The Mosses, the Lichens, and the Fungi remain subjects for lifelong study. The Fresh-water Algæ, the Desmidiaceæ, and Diatomaceæ, though they have been studied, have not yet been catalogued. Let me earnestly urge our younger members to devote themselves to the careful painstaking investigation of one of these groups. Natural History has little fascination for the mere idea; it has a continually-increasing and never-palling charm to the student who will but search deeply into the mysteries which hang over the morphology, the physiology, and homology of the minutest organ of the smallest organism, and compare them with the same parts in its nearer or more distant allies of the same and of other groups.

PART II.—THE ABYSSES OF THE OCEAN.

The fifteen years which have passed since I last had the honour of presiding over this Club, and addressing you from this Chair, have constituted a period marked by great progress of knowledge in most branches of Natural Science. I may especially call to your mind the astonishing discoveries which have been taking place as to the nature, properties, and interrelations of heat, light, electricity, and sound; the insight into the composition of terrestrial and heavenly bodies which Spectroscopy has given us; our altered views with regard to what used to be considered

elementary bodies; and the important changes which Chemistry has brought about in our metallurgical operations. But these, and many similar subjects, deeply important as they are, and necessarily interesting to every student of Nature, do not so directly come within the province of the Tyneside Naturalists' Field Club as the science of the study of life, namely, Biology. Yet even within the restricted area of Biology so rapid has been the march of investigation and acquired knowledge, that any attempt in an address such as this to summarize, however briefly, the progress of discovery, would of necessity end in failure. In reviewing the past then I would narrow the scope, and select a single topic to bring before you. It shall be *Deep Sea Dredging*, which has largely occupied the attention of Naturalists throughout the world during the period to which I have referred. At the commencement of these fifteen years "Deep Sea Dredging," as then understood, was being modestly inaugurated by Professor M. Sars in 300–400 fathoms at the Lofoden Islands, and by the British Association Dredging Committee, of which I was a member, in 100–200 fathoms, to the north of Shetland; but now Dredge and Trawl have brought us into connection with a new world, so to speak, which had hitherto been cut off from the knowledge of man by a great interspace of water several miles deep.

It is not my intention to go over again the oft-told tale of the instances in which living organisms had been brought from considerable depths. The fact remains that fifteen years ago the views entertained by Professor E. Forbes, that the bed of the ocean was azoic, was generally acquiesced in; and the great majority of Naturalists held the opinion that animals could not live without light, and under the great pressure which would act upon them in depths greater than a few hundred fathoms.

The explorations of H.M.S. '*Lightning*' in 1868, when Dr. Carpenter and Prof. Wyville Thomson found animal life to exist in great abundance in 500–600 fathoms between the Outer Hebrides and Faroe Islands, seriously shook the confidence of those who had maintained the azoic character of the depths of the sea; and when, in the following year, Prof. Wyville Thomson, in the

'*Porcupine*,' succeeded in obtaining a dredgeful of "Globigerina Ooze" from 2,435 fathoms,* which was found to contain living animals belonging to most classes of the Invertebrata, the attention of Naturalists throughout the world was concentrated on the subject. One nation after another inaugurated expeditions of research. England, the United States, and Canada; Germany and Denmark; Austria and Sweden; Holland and France, have in succession taken up the work of investigation. Nor is the interest engendered likely soon to cease. During this present year I have reason to believe that France, which last summer entered the lists, by the dredgings of '*Le Travailleur*' in the Bay of Biscay, in which by the special invitation of the French Government I took part, will prosecute more extended researches in the depths of the Mediterranean. Italy is preparing to follow in her wake; and our own Government will probably place another vessel at the disposal of my friend Sir Wyville Thomson, so as to enable him to extend the soundings commenced by the '*Knight Errant*' last year, and trace out with greater exactness the course of the cold and warm water currents which are found so close together in the trough between the Faroe and Shetland Islands, and which are characterized by distinctive Faunæ.

I will now proceed to review, first, from a Geological, and, secondly, from a Zoological standpoint, the results of these various expeditions. It may, however, be well, as an introduction to the consideration of the abyssal strata in course of formation, to notice those deposits which are being formed in the shallow seas around the shores of continents and islands.

A. *Shallow Water Deposits.*

On every sea beach we witness the gradual disintegration of the cliffs, and their comminution into the coarser or finer sand and mud on which we tread, while every storm-swollen river or streamlet, as it hurries towards the sea, bears in its turbid waters its burden of earth and sand destined to be sorted, sifted, and silted into such finer or coarser material on the sea bottom,

* See *Appendix A* for an account of this dredging.

at greater or lesser distances from land as would constitute similar geological strata to those which are presented to us in Conglomerates, coarser or finer grained Sandstones and Shales; whilst the animals, which vary according to climate, the degree of saltness of the water, and in a measure from the nature of the comminuted material, present us with the facies of what will be the Palæontological aspect of future Fossiliferous Beds. It is not until we are at a considerable distance from land—often 100 or 150 miles—that the effect upon the sea bottom of material brought down by rivers and of tidal action upon the land ceases. A. Agassiz, describing one of the most recent United States Dredgings, writes:—"While dredging to the leeward of the Carribbean Islands we could not fail to notice the large accumulations of vegetable matter and of land debris brought up from deep water, many miles from the shore. It was not an uncommon thing to find, at a depth of over 1,000 fathoms, ten or fifteen miles from land, masses of leaves, pieces of bamboo and of sugar cane, dead land shells, and other land debris, which are undoubtedly all blown out to sea by the prevailing easterly trade winds. We frequently found floating on the surface masses of vegetation more or less waterlogged, and ready to sink. The contents of some of our trawls would certainly have puzzled a Palæontologist; between the deep water forms of Crustacea, Annelids, Fishes, Echinoderms, Sponges, etc., and the mango and orange leaves mingled with branches of bamboo, nutmegs, land shells, both animal and vegetable forms being in such profusion, he would have found it difficult to decide whether he had to deal with a marine or a land fauna. Such a haul from some fossil deposit would naturally be explained as representing a shallow estuary surrounded by forests, and yet the depth might have been 1,500 fathoms. This large amount of vegetable matter, thus carried out to sea, seems to have a material effect in increasing, in certain localities, the number of marine forms."*

Passing now over the littoral and estuarine deposits, which of necessity take their character primarily from the nature of the adjacent land, we come to

* Bull. Museum, Comp. Zool., Vol. V., p. 295.

B. Near-Shore Deposits.

Mr. Murray* has divided the Near-Shore Deposits under four heads.

(*a*) *Blue and Green Muds*, which are met with near the shores of most of the great Continents and Islands.

(*b*) *Gray Muds and Sands*, which are found chiefly near Oceanic Islands of Volcanic origin.

(*c*) *Red Mud*, which occurs on the Eastern Coast of South America.

(*d*) *Coral Mud*, which covers the bed of the Ocean near Coral Reefs.

To these may be added

(*e*) *Glacial Clays.*

(*a*) The *Blue and Green Muds* owe their origin in a great measure to the disintegration of the older crystalline rocks of neighbouring land. It has been found that not unfrequently the green colour is however dependent on Glauconitic particles, and that the shells of Foraminifera in these deposits have become filled with Glauconite, and are in fact in process of being converted into a deposit of "Green Sand." When treated with acid the carbonate of lime is dissolved, and beautiful Glauconitic casts of the Foraminifera remain behind. Such deposits were met with in many places during the '*Challenger's*' dredgings. Instances of this kind were found in the North Atlantic, off the coast of Portugal, that of North America between Halifax and New York, and the eastern side of South America. The Blue Muds descend generally to deeper water than the Green, and the Glauconitic particles rarely occur beyond 700 fathoms, whereas the Blue Muds are frequently in 1,500, and even 2,500 fathoms.

(*b*) The *Gray Muds and Sands* derive their character from the debris of volcanic rocks, and the colour is sometimes so dark as to be almost black. Occasionally these volcanic sands are found as much as 200 miles from the volcanic islands, as, for instance,

* Proc. Royal Soc., XXIV., p. 518.

at Hawaii; and in depth they sometimes descend to nearly 3,000 fathoms.

(*c*) The *Red Mud* is a deposit taking place along the east coast of South America. "There can be little doubt but that this red colour is due to the presence of the ochreous matter carried into the Atlantic by the South American rivers, and there are reasons for thinking that the red colour of some of the deep sea clays in this region of the Atlantic may have a like origin." This Red Mud in places descends to 2,000 fathoms.

(*d*) *Coral Mud* is confined to the neighbourhood of Coral Reefs, and consists of the more or less comminuted particles of Coral and the calcareous remains of Mollusca, Polyzoa, Foraminifera, etc. This deposit, for example, is of great extent around Bermuda, and reaches from the edge of the reef down to a depth of 2,500 fathoms.

(*e*) *Glacial Clays* are in course of deposition around the Arctic and Antarctic poles, where the icebergs carry out to sea, and in melting let fall upon the bottom the mud, sand, and angulated stones and rocks which they have conveyed from the land.

C. Deep Sea Deposits.

The Deep Sea Deposits of the Great Oceans are known to assume five characters:—(*a*) *Globigerina Ooze*, (*b*) *Biloculina Ooze*, (*c*) *Red and Gray Clays*, (*d*) *Radiolarian Ooze*, (*e*) *Diatomacean Ooze*.

(*a*) The *Globigerina Ooze* covers the greater part of the Ocean floors in depths between 500 and 2,500 fathoms, except that it does not appear to extend in the Southern Ocean beyond Lat. 50° S., nor to the north beyond the Arctic Circle, nor was it observed in the Pacific north of Lat. 10° N. This Globigerina Ooze consists, as its name implies, of a vast percentage of the dead shells of Foraminifera belonging to the genus *Globigerina*. It is made up indeed mainly of the remains of animals which lived on the surface of the sea, and when dead have sunk to the bottom; of *Globigerina*, *Orbulina*, *Pulvinulina*, *Pullenia*, *Sphæroidina*, and *Hastigerina;* of Pteropod Mollusca, *Coccospheres*

and *Rhabdospheres*. The ooze thus consists almost entirely of calcareous matter, though minute fragments of mica, quartz, pumice, scoria, manganese, and other mineral particles may generally be detected in it, when the calcareous matter has been removed. The Globigerina Ooze is inhabited by a fauna which is remarkably rich and highly interesting. From it there have been brought to us, as it were, messengers from another world—animals related to a Fauna which a few years since was supposed to have ceased to exist for countless ages Here we find in the Hexactinellid Sponges representatives of the *Ventriculites* of the Chalk, to which such species as *Askonema Setubalense*, Kent, *Lefroyella decora*, Wyville-Thomson, *Azorica cribrophora*, Schmidt, *Syringidiun Zettelii*, Schmidt, and *Scleroplegma conicum*, Schmidt, bear a most striking resemblance. The Stalked Crinoids, which are extraordinarily abundant as fossils in many strata, were until recently believed to be excessively rare in a living state; and a single specimen of the two *Pentacrini* then known was worth fifty or sixty pounds, or even more. Several additional *Pentacrini* have now been discovered, and one of these, *P. Wyville-Thomsoni*, Jeffreys, was dredged so near the coast of Portugal that it may be regarded as a member of the European Fauna. The two longer known species, which live in shallower water than the Globigerina Ooze, have been taken in great abundance in the West Indian Seas. Mr. A. Agassiz writes, "Our collection of *Pentacrini* is quite extensive. We found them at Montserrat, St. Vincent, Grenada, Guadaloupe, and Barbadoes in several places, and in such numbers that on one occasion we brought up no less than one hundred and twenty-four at a single haul of the bar and tangles. We must, of course, have swept over actual forests of *Pentacrini* crowded together much as we find the fossil *Pentacrini* on slabs. Our series is now sufficiently extensive to settle satisfactorily the number of species of the genus found in the West Indies. There are undoubtedly the two species which have thus far been recognised. It is evident that they vary greatly in appearance, *P. Mülleri* being the most variable."*

* Bull. Mus. Comp. Zool., Vol. V., p. 269. According to Carpenter the Pentacrinus here named *P. Mülleri* is not that species, but *P. decorus*, Wyville Thomson.

The *Apiocrinidæ*, another family of the Crinoids of the Jurassic Period, are now also found to have modern representatives in *Bathycrinus Aldrichianus*, Wyville-Thomson; *B. gracilis*, Wy. Thom.; *Hyocrinus Bethellianus*, Wy. Thom.; and *Rhizocrinus Lofotensis*, Sars. The first and third of these are from the South Atlantic and Southern Ocean, while the others are European. *Bathycrinus gracilis* was dredged off the Bay of Biscay, and *Rhizocrinus Lofotensis* has a wide geographical range, though individually rare. I may mention that I dredged this Crinoid in 1879 near the mouth of the Hardanger Fiord, within half a mile of land, and in somewhat less than a hundred fathoms. Several families of *Echinoidea*, which had been supposed to have been long extinct, are found to be represented by highly interesting forms in the Globigerina Ooze. The *Saleniidæ*, which have existed since the Jurassic Period, have four known living species. The *Echinothuriidæ* of the Chalk, a remarkable family of Sea Urchins, in which the plates overlap each other like a coat of mail, so that the whole test is perfectly flexible, have allies in the existing genera *Asthenosoma* and *Phormosoma*. These Sea Urchins when dredged usually come up, as I have seen them in the Bay of Biscay, perfectly flat, but Agassiz obtained specimens in 1,200 fathoms near Jamaica, which, when they came to the surface, were "fully blown up, hemispherical and globular in shape." A third remarkable group of forms is allied to the fossil *Ananchitidæ;* and *Homolampas*, *Pourtalesia*, *Spatagocystis*, *Echinocrepis*, *Urechinus*, *Cystechinus*, and *Calymne* are certainly among the most highly interesting discoveries which have resulted from abyssal dredging.

A group of Macrourous Crustacea, the family *Eryonidæ*, which flourished in the Lyassic seas, but was supposed to have been extinct for countless ages, is found to be represented by many species closely allied to the fossil forms, and now lives, widely distributed, in the Globigerina Ooze throughout the world.

Although the ooze is composed of so large a percentage of the shells of Foraminifera, which live on the surface, these, though numerically so abundant, after all represent but a small number of the species of that class which occur in the ooze. The pelagic

remains are accompanied by fine living arenaceous and calcareous forms, and in the lesser depths at which the Globigerina Ooze is found, such non-pelagic forms greatly increase in numbers. On accurate examination of Globigerina Ooze obtained by the '*Porcupine*' in 1869, Stat. 87, Lat. 59° 37′ N., Long. 9° 11′ W., in 767 fathoms, I found that while sixty-five species of Foraminifera were present, seven only of these were known to live at the surface.

It is easy to picture to the mind these vast beds of Globigerina Ooze, which are now accumulating upon what may be called the uplands or plateaus of the bed of the ocean, converted hereafter into strata of chalk or limestone; indeed, Mr. Agassiz has found the ooze in the West Indies almost in the condition of chalk. He writes:—"We also obtained, in 994 fathoms, off Nuevitas, large blocks of genuine white chalk, composed mainly of Globigerina and Rotulinæ, large quantities of ooze and white clay, which proved to be only the white chalk in different stages of compression also came up in the trawl. If the conditions now existing at that depth at all resemble those of the time of the white chalk, I could readily understand how perfectly Sea Urchins or Mollusks would be preserved, if once enclosed in this homogeneous substance, to be gradually compressed into solid white chalk."*

(*b*) *Biloculina Ooze.*—As we approach the Arctic Circle, the Globigerinæ, which have been becoming more dwarfed, subglobular, and thick shelled, so as to have the distinguishing name given to them by Mr. Brady *Glo. Dutertrei, var borealis*, gradually lessen in number, and thus a different deposit has been found by the Norwegian North Atlantic Expedition to occupy the ocean between Norway and Spitzbergen on the one side, and Iceland and Greenland on the other. The bottom temperature is here at freezing point, or but little above it, and a deposit is taking place in which the Foraminifer *Biloculina ringens*, though far less abundant, in some measure takes the place occupied by Globigerina over the rest of the Atlantic. Mr. H. B. Brady has

* A. Agassiz, in Bull. Mus. Comp. Zool., Vol. V., p. 290.

carefully examined the composition of the material from a dredging of 1,862 fathoms in this district, and, after cleaning away the finest mud, found that of the residue *Biloculina ringens* formed fifty per cent., the arenaceous *Haplophragmium subglobosum*, M. Sars, twenty per cent., but Globigerinæ only four per cent. A calcareous deposit is thus taking place in the Arctic Seas, the component constituents of which appear to differ materially from the Globigerina Ooze of other parts of the ocean.

(*c*) *Red and Gray Clays.*—These clays are being laid down over vast districts in the Pacific, Southern, and Atlantic Oceans, at depths which exceed 2,000 fathoms. In the great abysses of the ocean the water possesses a solvent power, and takes back all the carbonate of lime which, under other conditions, the animals had themselves borrowed from it, and with which they had composed their shelly coverings or bony skeletons. It has been suggested that the dissolving character of the water arises from excess of carbon-dioxide, but the exact depth at which it begins to act appears to be from some unknown cause a fluctuating one. Few lime-secreting animals live in this mud, and the shells of Oceanic Mollusca and Foraminifera are dissolved as they fall through the three or four miles of water, or soon after reaching the bottom. Here, then, we no longer have a Globigerina Ooze but gray, red, or dark chocolate-coloured mud. "The red and chocolate colours of many of these clays is due to the presence of oxide of iron in the first and oxide of manganese in the latter instance." (Murray.) The origin of this mud has been a source of several theories, the one which at present finds most favour is that of Mr. Murray, who holds that it depends chiefly on volcanic matter, consisting of the felspar, of pumice, and scoria, together with the minerals incorporated with them. He supposes that the pumice, after floating for some time upon the surface, gradually "weathers" away, and the particles sink to the bottom. Manganese is being deposited in large quantities at these depths; it accumulates around some nucleus, which may be the ear-bone of a whale, or a shark's tooth, a small mineral, or piece of bone, and often forms large masses. Sometimes the trawl of the '*Challenger*' would bring up as much as a bushel of manganese

nodules of all sizes, from minute grains to the dimensions of a cricket ball. The composition of these nodules has been found by Mr. Buchanan to vary greatly, "different nodules containing different quantities of mechanically admixed mud, and the number of different elements found in them is very large. Copper, iron, cobalt, nickel, manganese, alumina, lime, magnesia, silica, and phosphoric acid have been detected in large numbers."* The skeletons, both shark and cetaceans, are dissolved, but the teeth of the former and the ear-bones of the latter resisting the action of the waters appear to be scattered over the surface of the Red Clay in vast numbers. At the '*Challenger's*' Stat. 307 the trawl brought up over one hundred sharks' teeth and thirty ear-bones of whales. As a consequence of the destruction of all calcareous depositions, and of the very slow rate at which we can conceive a bed to be laid down, which is dependent upon the decomposition of volcanic debris transported from volcanoes at a great distance, it may be assumed that the rate at which the Red Clay is formed must be incalculably slow. The Red Clay and its varieties appears to extend in gently undulating plains over the deepest depressions of the crust of the earth, and to cover no less than one hundred millions of square miles, at a depth seldom less than 2,500 fathoms, or nearly three miles beneath the surface of the sea. The Fauna which inhabits this vast region represents therefore the occupants of one half of the entire surface of the earth. It is, remarks Sir Wyville Thomson, "a Fauna, not certainly of extreme poverty, and very special in its nature; its speciality consisting mainly in its great uniformity and in the prevalence of certain types. There is every reason to believe that the existing physical condition of this area date from a very remote period, and that the present Fauna of the deep sea may be regarded as being directly descended from Faunæ which have successively occupied the same deep sea. In the meantime, changes involving lesser depths have been accompanied by the appearance and disappearance of the land and shallow water faunæ of the Jurassic, the Cretaceous, and the Tertiary periods. That the present abyssal fauna is the result of progressive change

* Proc. Royal Soc. Edinb., IX., 1878. p. 288.

there can be no room for doubt; but it would seem that in this case the progress has been extremely slow, and that it has been brought about almost in the absence of those causes, such as minor and local oscillations of the crust of the earth producing barriers and affecting climate, on which we are most inclined to depend for the modification of Faunæ."* Again he boldly writes, "There seems much reason for believing that the great ocean depressions of the present time have persisted through all the later geological periods, back probably as far as the Permian age, and perhaps much farther. If this be so, the length of time during which the vast area occupied by the abyssal fauna has maintained its continuity, and probably great uniformity in essential conditions, is incalculable; that is to say, it cannot in the present state of our knowledge be reduced even approximately to astronomical time."†

(*d*) *Radiolarian Ooze.*—In certain portions of the greatest depths, where an ordinary red clay might have been expected to occur, deposits are found in which microscopic siliceous organisms play an important part, and the bottom takes its character, not in this case from the Foraminifera of the surface for these are decomposed before or soon after they reach the bottom, but from the siliceous skeletons of still more minute beings upon which the water has no chemical action. Thus in certain parts of the West and Mid Pacific, between latitudes 10° S. and 20° N., an ooze is being formed, which consists mainly of the remains of Radiolaria. This deposit was found at eight stations, including the deepest sounding which was taken during the voyage of the '*Challenger*' at a depth of over five miles.‡ The number of exquisite forms of Polycystina and Acanthystina in this deposit is astonishing, and they equal in beauty and variety the forms in the well-known Radiolarian fossil deposit in Barbadoes, of which the counterpart has now been found in a recent state.

(*e*) *Diatomacean Ooze.*—This ooze may be considered to take, in the Antarctic Circle, the place of the Biloculina Ooze of the

* Report Scientific Results *Challenger*, Vol. I., p. 50.

† Voyage of '*Challenger*' in the North Atlantic, Vol. II., p. 332.

‡ Sounding 247, 23rd March, 1875, 4,475 fathoms. Lat. 11° 24′ N.

Arctic Circle. Like the Radiolarian Ooze it is a siliceous deposit, but is composed of the frustules of Diatomaceæ, which minute vegetable organisms live on the surface, and sink to the bottom after death. The deposit occurs in depths ranging from 1,260 to 1,950 fathoms, and, as observed by the '*Challenger*,' is best developed between the north edge of the Antarctic icefields and lat. 60° S. The extraordinary abundance of Diatomaceæ in the Southern Sea has long been known, and Dr. J. D. Hooker found them everywhere staining the ice and snow at the water's edge a pale ochreous brown. "A deposit of mud, chiefly consisting of the siliceous loricæ of Diatomaceæ, not less than 400 miles long and 120 miles broad, was found at a depth of between 200 and 400 feet, on the flanks of Victoria Land, and in 70° S. latitude. Of the thickness of this deposit no conjecture could be formed; but that it must be continually increasing is evident, the silex of which it is in a great measure composed being indestructible."* Similar deposits in a fossilized state are known in the neighbourhood of the Mediterranean, also at Richmond in Virginia, and in Bermuda.

The conditions of life, as they affect animals, at depths ranging from 500 to 5,000 fathoms, are not so dissimilar as at first might be imagined. For while it is true that the pressure at the former depth would be half a ton to each square inch of surface, and at a depth of five miles it would amount to no less than five tons, yet the compressibility of water is so slight, that its density even under such an enormous superincumbent weight is only very slightly increased; and thus animals permeated throughout with water are not oppressed with the burden which they have to bear, as we might at first suppose. Again, there is a remarkable uniformity of temperature throughout the great mass of ocean waters when once the first few hundred fathoms have been passed. Temperature at great depths is found to be limited in range to the six or eight degrees above freezing point. Towards the Poles, both North and South, this isothermal line rises towards the surface; as a consequence, invertebrata usually living in abyssal regions are here found at much less depths. The

* Carpenter, *The Microscope*, 5th edition, p. 340.

Fauna of the great abyss is remarkably characteristic, and preserves its peculiar facies everywhere. Many identical forms have been proved, in the few lines of dredgings which have already been taken, to exist in every ocean. Others have occurred at stations separated by many thousands of miles, and everywhere representative species of families, which were unknown to exist prior to these abyssal explorations, are found coming up in the dredge, to bear their testimony that throughout the vast region of the great abyss a special fauna exists, which possesses well marked features of its own, and in all parts is characterized by closely related if not identical species, which are wholly absent from those shallower waters affected by the direct radiation of heat from the sun.

The fauna found in 100–500 fathoms is extremely rich. It embraces species in every class which on the one hand are not met with at lesser depths, but on the other do not descend to the abyss. At the same time a large portion of shallow water forms descend to this region, while some also of the truly abyssal groups and species begin here to make their appearance.

In from 500–1000 fathoms the fauna continues to consist of almost all the species which had first appeared in between 100–500 fathoms, though some forms which are found above the 100 fathoms line still linger, while the fauna is probably augmented by almost all the species which are truly abyssal, or "benthal," as Dr. Jeffreys has suggested they should be called. At the same time the fauna of this region is not so extensive as that between 100 and 500 fathoms.

In greater depths than 1,000 fathoms the number of species would certainly seem to diminish, and this diminution is carried much further when at about 2,500 fathoms the Globigerina Ooze gives place to the Red Clay. It has been already observed that the animals at these depths have a peculiar facies of their own, and although all classes have still their representatives, and thus it is indubitably proved that lime-secreting animals can live in the water at this depth, which, at the same time, dissolves shell-structure. It would appear to follow that there must be a continual battle between the animal and the water whether the one

can secrete or the other destroy shell most rapidly. In this battle such shell-structure as is protected by overlying tissues of the animal has more chance of escape than the exposed testaceous coverings of Mollusca, and this will probably account for the excessive rarity of this class on the Red Clay.

I have carefully prepared two tables,* which I lay before you. The first of these shows our present knowledge of the fauna which inhabits the greatest depths on a Red Clay bottom, and the second contains a List of the Animals which have as yet been observed in the North Atlantic at depths exceeding 1,000 fathoms. The North Atlantic has been considered in these tables as extending southwards to Lat. 32° N., that is to a line drawn through Bermuda and Madeira; but in order more effectually to exclude the tropical fauna, I think it would have been better to consider the North Atlantic as terminating at Lat. 35°, or a line from Cape Hatteras, on the American coast, to a point just south of the Straits of Gibraltar on the eastern side. The difference of these three degrees, though trifling as regards the deep-sea fauna, which is here alone considered, would be found considerable with respect to the shore and shallow water Invertebrata.

A few general remarks on the fauna of depths exceeding 500 fathoms may not be without interest.

Fishes.—Fish have been procured by trawl and dredge at all places down to 3,000 fathoms, but in the greatest depths the number of groups represented appears to be limited, and consists chiefly of members of the families Murænidæ, Clupeidæ, Scopelidæ, Stomiatidæ, Ophidiidæ, Macruridæ, Pediculati, and in the Arctic Seas by many *Lycodidæ*. The Murænidæ are known to descend in the Atlantic to 2,500 fathoms, in the Southern Ocean to 1,400 fathoms, and in the Pacific to 2,000 fathoms. The Scopelidæ reach 2,550 fathoms in the Atlantic, 1,950 in the Southern, and 2,150 fathoms in the Pacific Ocean. The Clupeidæ, as represented by *Holosaurus*, descend to 2,750 in the Atlantic and 1,375 fathoms in the Southern Ocean. The family Stomiatidæ has numerous abyssal representatives, which have been

* These tables have been revised and filled up to the present date (August, 1883), and will be found printed as *Appendix B* and *Appendix C*.

found in 2,500 fathoms in the Atlantic, 2,150 in the Southern, and 2,900 fathoms in the Pacific. Sternoptychidæ are frequently brought up by the trawl, when it has come from the greatest depths, but Sir Wyville Thomson remarks that fish of this family certainly do not come from the bottom, but are probably caught in the passage of the net at some little distance below the surface, "where there is reason to believe that there is a considerable development of a peculiar pelagic Fauna." The members of this "aberrant family of the Physostomi are singular and beautiful fishes, distinguished by having on some part of the body ranges of spots or glands producing a phosphorescent secretion. The surface of the body is in most of the species devoid of scales, but in lieu of these the surface of the skin is broken up into hexagonal or rectangular areæ, separated from each other by dark lines, and covered with silvery pigment, dashed with various shades of bronze, or green, or steel blue."* The delicate and very interesting fishes, which belong to the family Ophidiidæ, descend to very great depths; in the Atlantic they have been taken in 2,500 fathoms, in the Southern Ocean in 1,975 fathoms, and in the Pacific, besides other forms, blind species have been procured in 2,150 and 2,440 fathoms, and a transparent species in 2,600 fathoms. A valuable and elaborate memoir has just been published, as the second portion of the *Fauna and Flora des Golfes von Neapol*, by Dr. Carlo Emery on a remarkable fish of this family, named *Fierasfer*, which spends a portion of its life living parasitically within the bodies of large Holothurian Echinoderms (*Stichopus regalis* and *Holothuria tubulosa*). The Pediculati are represented in the Atlantic by *Ceratias uranoscopns*, Murray, which descends to 2,400 fathoms. The Macruridæ are eminently an abyssal family, and have been taken down to 1,900 fathoms in the Atlantic, 1,950 in the Southern, and 2,425 in the Pacific Ocean. The genus *Lycodes* of Reinhardt is peculiarly an Arctic and Antarctic genus, of which six species were found during the Norwegian North Atlantic Expeditions on smooth clayey bottom in the Polar Sea at depths ranging from 260 to 1,333 fathoms.

* Voyage of the '*Challenger*' in the North Atlantic, Vol. II., p. 3.

Tunicata.—The Tunicata of the deeper parts of the ocean are few in number, but interesting in character, and sometimes remarkable for their size.

Mollusca.—Certain groups and genera of Mollusca are eminently characteristic of depths of 500–2,000 fathoms. Among Lamellibranchiata *Pecten*, *Amussium*, and *Lima* represent the Ostreacea. The Mytilacea occur in the genera (*Modiola lutea*), *Idas*, and *Dacrydium*. Arcacea are almost always found in some forms of *Nucula*, *Leda* (*Portlandia*), *Malletia*, *Glomus*, *Arca*, or *Limopsis*. The Lucinacea have many representatives in the genus *Axinus*, and also in *Kellia*, *Kelliella*, and *Montacuta*. *Abra* puts in an appearance for the Tellinacea; and *Lyonsia*, and numerous species of *Pecciolia* and *Neæra* for the Myacea. The class Solenoconchia is quite at home, and embraces *Dentalium*, *Siphonodentalium*, *Entalina*, and *Cadulus*. Of the class Gasteropoda we find among Onychoglossa the genus *Propilidium;* among *Rhaphidiglossa*, numerous genera, especially *Fissurisepta*, *Scissurella*, *Trochus*, *Cyclostrema*, *Ganessa*, and *Sequenzia;* among Tænioglossa, *Cithna*, *Dunkeria*, and *Natica;* among Ptenoglossa, *Scalaria* and *Aclis;* among Gymnoglossa, *Eulima* and *Odostomia;* among Toxoglossa, *Pleurotoma*, *Defrancia*, and *Taranis;* among Rhachiglossa, *Metzgeria* and *Trophon;* among Odontoglossa, *Pyrene* and the subgenera of *Fusus;* among Tectibranchiata, *Utriculus* and *Scaphander*. In the first famous dredging of the '*Porcupine*' in 1869, Stat. 37, five Mollusca were found in 2,438 fathoms. These were the pretty little Mussel *Dacrydium vitreum*, Möll, which I have dredged near the mouth of the Hardanger Fiord in not more than 80 fathoms, *Dentalium candidum*, *Amussium fenestratum*, and *Abra nitida*. The last species is perhaps better known to British Conchologists as *Syndesmya intermedia*, and has an enormous range in depth, from 3 to 2,435 fathoms.

Brachiopoda.—Of North Atlantic Brachiopods *Terebratula vitrea*, Born, is known to descend to 1,456 fathoms; *Terebratula caput-serpentis*, Linn., to 1,180 fathoms; *Waldheimia tenera*, Jeff., to 1,450 fathoms; *Atretia gnomon*, Jeff., to 1,750 fathoms; and *Discina Atlantica*, King, to 2,425 fathoms. *Terebratula Wyvillei*,

Davidson, was dredged by the '*Challenger*' in the middle of the Pacific at the vast depth of 2,900 fathoms, and twice on Red Clay.

Polyzoa.—Polyzoa are found at all depths, but almost all the species belong to the Chilostomata, the orders Cyclostomata and Ctenostomata being scarcely represented beyond 1,000 fathoms. The genera which descend deepest are *Catenaria*, *Cellularia*, *Menipea*, *Nellia*, *Canda*, *Bicellaria*, *Bugula*, *Kinetoskias*, *Farciminaria*, *Flustra*, *Carbasea*, *Salicornaria*, and *Bifasciaria*. *Kinetoskias* is a very beautiful form, allied to *Bugula*, and is synonymous with *Naresia* of Wyville Thomson. Four species are known—*K. Smittii*, Danielssen, first found in 80 fathoms in Nordland, and afterwards in Kors Fiord, Norway, in which latter locality I dredged a fragment in 1878 in 200 fathoms; *K. arborescens*, D. (= *Bugula umbella*, Smitt), recorded from 90 fathoms, Vadso, by Danielssen, and from 40 fathoms, Spitzbergen, by Smitt; and a third specimen, which was dredged during the Canadian Government investigations on the River St. Lawrence, has been sent to me for determination by Mr. Whiteaves. The '*Challenger*' abyssal forms are *K. cyathus*, Wyv. Thomson,* which was dredged in 1,525 fathoms, south-west of Cape St. Vincent, and afterwards in 2,650 fathoms, in the latitude of Buenos Ayres; and *K. pocillum*, Busk, procured in 2,160 fathoms, near the Azores.

Crustacea.—I am not aware that any Brachyurous Crustacea have been recorded as found below 1,000 fathoms, although, since many species such as *Ebalia nux*, Norman, *Amathia Carpenteri*, Norman, *Ethusa granulata*, Norman, *Lispognathus Thomsoni*, Norman, *Homolopsis rostratus*, A. Milne Edwards and others are known to descend to 500–700 fathoms, they might reasonably be expected to be found living at greater depths. Macroura are remarkably abundant in the greatest depths, and are represented by very distinctive genera, including the family *Eryonidæ*, which has been already referred to. In 500–2,000 fathoms, Mysidea, Cumacea, and the interesting family Munnopsidæ (*Isopoda remigantia* of Sars) abound, but on account of their small size and

* Figured in Voyage of the '*Challenger*.'—The Atlantic. Vol. I., p. 143.

the fragility of their structure often escape notice. Isopoda, especially *Apseudes*, *Tanais*, *Anthura*, and allied genera, Amphipoda, Ostracoda, and Cirripedia, all seem to be represented at the greatest depths.

Annelida.—The Report on the '*Challenger*' Annelida has not yet been published, but twenty-nine species are known to inhabit the North Atlantic in depths exceeding 1,000 fathoms. Thomson tells us that an Annelid "allied to *Euphrosyne*" was procured by the '*Challenger*' in 2,220 fathoms in the North Atlantic, and that from a bottom of Red Clay, in the extreme depth of 2,975 fathoms, there came up "many long cases of a tube-building Annelid, evidently formed out of gritty matter, which occurs, though sparingly, in the clay. The tubes and their content were found by Dr. Willemoes-Suhm to belong to the family Ammocharidæ, closely allied to the Maldania or Clymenidæ, all of which build tubes of sand or mud." Near the Canaries the anomalous genus *Balanoglossus* was brought up from 2,500 fathoms, where it was living on a dark volcanic sandy bottom.

Gephyrea.—The Norwegian North Atlantic Exploring Expedition procured three genera of Gephyrea from depths exceeding 1,000 fathoms. A Gephyrea was dredged by the '*Challenger*' on compact yellowish ooze in 1,945 fathoms near the Canaries, which Willemoes-Suhm regarded as "shewing a combination of characters of the Sipunculacea and Priapulacea," and to which he gave the name *Leioderma*.

Echinodermata.—Echinodermata of all orders are apparently at home in all depths, and in the great abysses several groups unknown in shallower parts of the ocean present themselves. I have already referred to the Echinoid families, Saleniidæ, Echinothuriidæ, and Ananchytidæ; and also to the Crinoidea. The Sea Puddings are largely represented by an entirely new order, Elasipoda of Theel, the numerous members of which are everywhere present in the abyss of the ocean, but very rarely appear—if we except one or two forms in the Arctic Regions—in less than 500 fathoms. Asteroidea and Ophiuroidea abound; among the former the new genus *Hymenaster*, which has numerous species, is noteworthy on account of the delicacy of its structure.

Cœlenterata.—Hydrozoa are represented by a giant form, *Monocaulus*, which lives on the Red Clay in the Pacific, and has a stem more than six feet high, and a polyp, which is some sixteen inches across the crown of its expanded tentacles. On a small piece of shell dredged by the '*Valorous*' in 1,785 fathoms I observed some chitinous tubes, which appeared to belong to a species of *Stephanoscyphus*, and similar tubes were found in the '*Challenger*', attached to ear-bones of whales, and concretions of iron and manganese from the Red Clay of the Pacific. Simple Corals and Sea Anemones descend to all depths, but branched Corals do not seem to occur below 1,000 fathoms.

Porifera.—Sponges, more especially the Hexactinellidæ, Lithistidæ, and Geodiadæ are extremely abundant in 500–1,000 fathoms, and are found in the greatest depths, but the forms from 1,000–3,000 fathoms have not yet been determined.

Foraminifera are found everywhere, but in the greatest depths arenaceous forms bear a much larger percentage to calcareous species than is the case nearer shore.

A few half-filled dredges of mud are all that have yet been procured to introduce us to the fauna which lives throughout vast unknown regions, which occupy many millions of square miles, underlying strata of water two to five miles and more in depth. It will probably be left to our children's children to solve some of the thousand problems now opening out before us. Meanwhile investigation must patiently go on, and our knowledge of this new world must be slowly built up step by step. Gradually is the Dredge making its power more felt; day by day is it taking a more prominent position among instruments of philosophical research. If that excellent naturalist and amusing wag, Edward Forbes, were among us now, he would doubtless give us another version of the following "Dredging Song," which he sung at a "Red Lion Dinner" of the British Association a generation ago.

THE DREDGING SONG.*

Hurrah for the dredge, with its iron edge,
And its mystical triangle,
And its hided net, with meshes set,
Odd fishes to entangle!
The ship may rove through the waters above,
'Mid scenes exciting wonder,
But braver sights the dredge delights,
As it roves the water under.
Chorus—Then a dredging we will go, wise boys,
Then a dredging we will go.

Down in the deep, where the mermen sleep,
Our gallant dredge is sinking,
Each finny shape in a precious scrape
Will find itself in a twinkling!
They may twirl and twist, and writhe as they list,
And break themselves into sections,
But up they all, at the dredge's call,
Must come to fill collections.
Then a dredging, etc.

The creatures strange the sea that range,
Though mighty in their stations,
To the dredge must yield the briny field
Of their loves and depredations:
The crab so bold, like a knight of old
In scaly armour plated;
And the slimy snail, with a shell on his tail,
And star fish radiated.
Then a dredging, etc.

Were I a fish (though I've no such wish
For a tail—the more's the pity)
I'd anathematize the prying eyes
Of the terrible Dredging Committee;
No fish am I, but high and dry
'Mid dredgers take my station,
A-catching the fishes, all at the wishes
Of the British Association.
Then a dredging, etc.

* By Edward Forbes. I give it here from a manuscript copy which I procured from my late friend Mr. Alder. The last verse is not given in the version published in the Life of Forbes.

APPENDIX *A*.

THE FIRST DREDGING IN THE GREAT ABYSS.

Since my Address was delivered in 1880 my kind friend Sir Wyville Thomson has been taken from us. I think it may be of interest to publish the following letter as possessing some historic value. It gives, as will be seen, an account of the first dredging which exceeded 2,000 fathoms, and was read by me at the British Association Meeting at Exeter directly after it was received. It was through it that the success he had achieved was thus first made known, though this letter is now for the first time put into print.

"Belfast, August 7th, 1869.

"My dear Norman,

"You are already aware that during the first cruise of the year Mr. Jeffreys and his party dredged and took most important thermometrical and other observations to a depth of 1,476 fathoms. When I took Mr. Jeffreys' place for the second cruise it was the intention to proceed northwards, and to work up a part of the North West passage north of Rockall. I found however on joining the vessel the gear in such perfect order, all the arrangements so excellent, the weather so favourable, and the confidence of our excellent commander so high, that after consulting with Captain Calver I suggested to the Hydrographer that we should turn southwards and explore the very deep water off the Bay of Biscay. I was anxious that, if possible, the great questions of the distribution of temperature and of the conditions suitable to the existence of animal life should be finally settled, and the circumstances seemed singularly favourable.

"No thoroughly reliable soundings have been taken beyond 2,800 fathoms, and I felt that if we could approach 2,500 all the grand problems would be virtually solved, and the investigation of any greater depth would be a mere matter of detail and curiosity.

"The Hydrographer at once consented to this change of plan, and on the 17th of July we left Belfast, and steered round to

Cork, where we coaled, and then stood out towards some soundings about a couple of hundred of miles S.W. of Ushant, marked on the Admiralty Chart 2,000 fathoms and upwards. On the 20th and 21st we took a few hauls of the dredge on the slope of the great plateau in the mouth of the Channel, in depths from 75 to 725 fathoms, and on the 22nd we sounded with a 'Hydra' sounding apparatus, the depth 2,435 fathoms, with a bottom of fine Atlantic Chalk-Mud, and a temperature registered by two standard Miller-Six's thermometers of 36·5° Fah.

"A heavy dredge was put over in the afternoon, and slowly the great coil of rope melted from the 'Aunt Sallies,' as we call a long line of iron bars, with round wooden heads, on which the coils are hung. In about an hour the dredge reached the bottom upwards of three miles off.

"The dredge remained down about three hours, the Captain moving his ship slowly up to it from time to time, and anxiously watching the pulsations of the accumulator, ready to meet and ease any undue strain. At nine o'clock P.M. the drums of the donkey engine began to turn, and gradually and steadily the 'Aunt Sallies' filled up again at the average rate of about two feet of rope a second. A few minutes before one o'clock in the morning two hundredweight of iron, the weights fixed 500 fathoms from the dredge, came up, and at one o'clock precisely a cheer from a breathless little band of watchers intimated that the dredge had returned in safety from its wonderful and perilous journey of more than six statute miles. A slight accident had occurred. In going down the rope had taken a loop round the dredge, so that the bag was not full. It contained, however, enough for our purpose, one and a half hundredweight of Atlantic ooze, and so the feat was accomplished. Some of us tossed ourselves down on the sofas, without taking off our clothes, to wait till daylight to see what was in the dredge.

"The next day we dredged again in 2,090 fathoms, practically the same depth, and brought up two hundredweight of ooze; the bottom temperature 36·4°; and we spent the rest of the day in making what will, I am sure, prove a most valuable series of

temperature observations at every 250 fathoms point from the bottom to the surface.

"These enormously deep dredgings could not be continued. Each operation required too much time, and the strain was too great, both upon the tackle and upon the nervous systems of all concerned, especially of Captain Calver and his officers, who certainly did all that could be compassed by human care, skill, and enthusiasm to insure success. We crept home dredging in easier depths.

"We start again to-morrow, and, as you may suppose, I have enough to do. I can therefore only give you the slightest possible sketch of our results, anticipating fuller information when I have time to collate the diaries and to look over the species.

"First.—*As to Temperature.* The super-heating of the sun extends only to the depth of about twenty fathoms. Another cause of super-heating—probably the Gulf Stream extends to the depth of 500 to 700 fathoms, after that the temperature gradually sinks at the rate of about 0·2° for every 200 fathoms. This is probably the normal rate of decrease, any deviation being produced by some special cause—a warm or a cold current.

"Secondly.—*The Aeration of the Water.* Mr. Hunter, who accompanied me as Physicist, found the water from great depths to contain a large excess of carbonic acid, and he found the water at all depths to contain a considerable portion of dissolved organic matter, thus in every way bearing out the observations of Mr. W. L. Carpenter during the first cruise.

Thirdly.—*Distribution of Life.* Life extends to the *greatest depths*, and is represented by all the marine Invertebrate groups. At 2,435 fathoms a handsome *Dentalium* and several other Mollusca, one or two Crustacea, several Annelids and Gephyrea, a very remarkable Crinoid with a stem four inches long I am not prepared yet to say whether a mature form or a *Pentacrinoid*, several Star Fishes, two Hydroid Zoophytes, and many Foraminifera were obtained.

"Still the Fauna has a *dwarfed* and Arctic look. This is doubtless from the cold. At 800 to 900 fathoms, temperature 40° Fah. and upwards, the Fauna is rich, and is specially

characterized by the great abundance of Vitreous Sponges, which seem to be nearly related to, if not identical with, the *Ventriculites* of the Chalk. This year's work has produced many forms new to science, and many new to the British Fauna. Among the most remarkable in the groups I have been working at I may mention a very singular Echinoderm, representing a totally new group of the Sub-kingdom; a splendid new Ophiurid; *Brisinga endecacnemos;* many specimens of Sars' *Rhizocrinus Lofotensis;* many Vitreous Sponges, including specimens of *Aphrocallistes*, *Holtenia*, and *Hyalonema;* a fine *Solarium* from the coast of Kerry, and many other things.

"As I am only writing in the interval of scaling the boilers, with no opportunity of going over the collection, you must accept this sketch. I trust to your contributing the Crustacea, which will be sent to you as soon as possible.

"I will write again from Lerwick.

"Ever yours truly,

"Wyville Thomson."

APPENDIX *B*.

THE FAUNA OF THE GREATEST ABYSSES OF ALL OCEANS.

In the following table* is shown the relative frequency in the occurrence of the principal groups of animals at the fifty-two stations at which Dredging or Trawling was effected by the '*Challenger*,' in depths which exceeded 2,000 fathoms, irrespective of the nature of the bottom, whether Globigerina Ooze, Radiolarian Ooze, Diatomacean Ooze, Red Clay, or Gray Mud.

Pisces	20	Pantopoda	2
Cephalopoda	2	Gephyrea	7
Gasteropoda	7	Annelida	21
Lamellibranchiata	12	Holothuroidea	16
Brachiopoda	8	Echinoidea	9
Tunicata	4	Asteroidea	15
Polyzoa	18	Ophiuroidea	18
Macroura	24	Crinoidea	3
Schizopoda	4	Zoantharia	14
Edriophthalma	7	Alcyonaria	16
Ostracoda	8	Hydromedusæ	4
Cirripedia	7	Porifera	26

* This table is compiled from those given in the '*Challenger*' Report by Sir Wyville Thomson, Vol. I., p. 36, 37.

ANIMALS RECORDED AS PROCURED ON RED CLAY IN ALL OCEANS.

I think some doubt must be entertained whether the Ostracoda in the following lists from 1,825 fathoms really *lived* on the Red Clay. The dredging, which is remarkably shallow for Red Clay, was taken just at the edge of the vast Red Clay region in the South Pacific, near the shore of western South America, and very near to Globigerina Ooze, from which it is possible that the Ostracoda had been drifted to the locality where they were found.

PISCES.	fms.
Typhlonus nasus, *Gunther*	2,440
Echiostoma microdon, *Gunther*	2,440
Bathypterois longicanda, *Gunther*	2,550
Gonostoma gracile, *Gunther*	2,425
MOLLUSCA.	
Dentalium leptosceles, *Watson*	2,600
BRACHIOPODA.	
Terebratula Wyvillei, *Davidson*	2,600
TUNICATA.	
Culeolus Murrayi, *Herdman*	2,300
Stycla bythia, *Herdman*	2,600
Hypobythus calycodes, *Herdman*	2,900
POLYZOA.	
Farciminaria pacifica, *Busk*	2,300
Salicornaria malvinensis, *Busk*	1,450
,, tenuirostris, var. tenuis, *Busk*	2,200
,, bicornis, *Busk*	2,200
Bifaxaria abyssicola, *Busk*	3,125
CRUSTACEA.	
Haliporus curvirostris, *Bate*	2,375
Hepomadus inermis, *Bate*	2,550
Gennadus parvus, *Bate*	2,425
Boreomysis obtusata, *G. O. Sars*	2,740
Bairdia hirsuta, *G. S Brady*	1,825
Cythere Suhmi, *G. S. Brady*	2,300
,, circumdentata, *G. S. Brady*	2,350

	fms.
Cythere Normani, *G. S. Brady*	1,825
,, dasyderma, *G. S. Brady*	1,825
,, acanthoderma, *G. S. Brady*	1,825
,, dictyon, *G. S. Brady*	1,825
Krithe producta, *G. S. Brady*	1,825
Cytheropterum mucronulatum, *G. S. Brady*	1,825
,, abyssorum, *G. S. Brady*	2,600

ECHINODERMATA.

Elpidia glacialis, *Theel*	2,600
,, rigida, *Theel*	2,300
Scotoplanes mollis, *Theel*	2,600
Periagone atrox, *Theel*	2,600
Scotoanassa diaphana, *Theel*	2,600
Achlyonice paradoxa, *Theel*	2,300
Oneirophanta mutabilis, *Theel*	2,900
Benthodytes typica, *Theel*	1,500
,, mamillifera, *Theel*	2,225
Pourtalesia laguncula, *A. Agassiz*	2,900
Cystechinus Wyvillei, *A. Agassiz*	1,825
Marsipaster spinosissimus, *Sladen*	2,335
Hymenaster geometricus, *Sladen*	2,335
,, echinulatus, *Sladen*	2,335
,, carnosus, *Sladen*	1,500
,, infernalis, *Sladen*	2,900
Benthaster Wyville-Thomsoni, *Sladen*	2,900
Porcellanaster tuberosus, *Sladen*	1,875
,, crassus, *Sladen*	2,335
Ophioglypha Loveni, *Lyman*	2,600
,, bullata, *Wyv. Thomson*	2,650
,, convexa, *Lyman*	2,350
,, undata, *Lyman*	1,450
Ophiocten pallidum, *Lyman*	2,600
Ophiomusium Lymani, *Wyv. Thomson*	1,825
Ophiomastes tegulitius, *Lyman*	2,600
Amphiura cernua, *Lyman*	2,300
Amphilepis papyracea, *Lyman*	2,150
Ophiochyta epigrus, *Lyman*	2,350
Ophiacantha placentigera, *Lyman*	1,350
Ophiambix aculeatus, *Lyman*	1,350
Ophiogeron edentulus, *Lyman*	1,350
Ophiohelus pellucidus, *Lyman*	1,350
Ophiothela supplicans, *Lyman*	1,825

	fms.
Ophiocreas abyssicola, *Lyman*	2,300
Antedon	2,900

HYDROZOA.

Stephanoscyphus	
Monocaulus	
? Leonura terminalis, *Haeckel*	2,160 ?

ACTINOZOA.

Coralliomorphus profundus, *Moseley*	2,025
Antheomorpha elegans, *Hertwig*	2,900
Liponema multiporum, *Hertwig*	1,875
Amphianthus bathybium, *Hertwig*	2,300
Porponia elongata, *Hertwig*	2,600
Deltocyathus Italicus, *M. Edw. & Haime*	2,375
Bathyactis symmetrica, *Pourtales*	2,900
Umbellula Thomsoni, *Kolliker*	2,125
,, leptocaulis, *Kolliker*	2,440
Scleroptilon grandiflorum, *Kolliker*	2,300

SPONGIDA.

Sponges are numerous on the Red Clay, but they have not yet been determined.

FORAMINIFERA.

Some of the Red Clay dredgings are comparatively rich in calcareous bottom Foraminifera. Mr. Brady tells me that Stat. 276 (2,350 fathom), for example, has twenty-six species and varieties of *Lagena* amongst other things; while Stat. 253 (3,125 fathoms) has, in addition to six oceanic forms, thirty-one bottom species, of which sixteen are calcareous and fifteen arenaceous. Arenaceous forms, however, usually constitute the larger portion of the Foraminifera from extreme depths.

APPENDIX *C.*

THE FAUNA, AS FAR AS YET KNOWN, WHICH LIVES IN THE NORTH ATLANTIC OCEAN* AT GREATER DEPTHS THAN ONE THOUSAND FATHOMS.

	fms.
PISCES.	
Lycodes frigidus, *Collett*	1,333
Caranx amblyhynchus, *Cuv. & Val.*	1,386
Poromitra capito, *G. & B.*	1,632
Haloporphyrus viola, *G. & B.*	1,242
Rhodichthys regina, *Collett*	1,280
Macrurus asper, *G. & B.*	1,242
Coryphænoides carapinus, *G. & B.*	1,241
Chalinura simula, *G. & B.*	1,241
Cyclothone lusca, *G. & B.*	1,386
Bathyophis ferox, *Gunther*	2,760
Scopelus Mülleri, *Gmelin*	1,110
Holosaurus macrochir, *Gunther*	1,242
Nemichthys scolopaceus, *Richardson*	1,047
TUNICATA.	
Culeolus perlatus, *Suhm*	1,700
MOLLUSCA.	
Scaphander puncto-striatus, *Mig. & Adams*	1,536
,, gracilis, *Watson*	1,000
Cylindrobulla fragilis, *Jeffreys*	1,536
Cylichna alba, *Brown*	1,400
Utriculus substriatus, *Jeffreys*	1,750
,, lacteus, *Jeffreys*	1,450
,, olivaceus, *Watson*	1,000
,, leucus, *Watson*	1,000
Actæon exilis, *Jeffreys*	1,456
,, chariis, *Watson*	1,000
,, amabilis, *Watson*	1,000
Ringicula peracuta, *Watson*	1,075
Sipho propinquus, *Alder*	1,380
,, Sabini, *Gray* (fragments)	1,450
,, Bocagei, *P. Fischer*	1,121
,, attenuatus, *Jeffreys*	1,215
,, fusiformis, *Broderip*	1,630

*See page 105 for definition of "North Atlantic," as here employed.

	fms.
Neptunea Mohni, *Friele*	1,333
,, Danielsseni, *Friele*	1,333
Buccinum aquilarum, *Watson*	1,000
Nassa prismatica, *Br.*	
,, Edwardsii, *Fischer*	2,522
Pyrene costulata, *Cantraine.*	
Trophon multilamellosus, *Phil.*	
,, Fabricii, *Beck*	1,415
Spirotropis carinata, *Phil.*	
Pleurotoma torquata, *Phil.*	
,, tenuicostata, *M. Sars*	1,450
,, exarata, *Möller*	1,230
,, acanthodes, *Watson*	1,075
,, decussata, *Phil.*	
,, macra, *Watson*	1,000
,, incincta, *Watson*	1,000
,, tiara, *Watson*	1,000
,, pruina, *Watson*	1,000
,, quadruplex, *Watson*	1,000
Defrancia chariessa, *Watson*	1,000
,, streptophora, *Watson*	1,000
,, chyta, *Watson*	1,000
,, nodulosa, *Jeffreys*	1,216
,, tenella, *Jeffreys*	1,936
Eulima stenostoma, *Jeffreys*	1,456
Odostomia flexuosa, *Jeffreys*	1,456
Aclis Walleri, *Jeffreys*	1,622
Scalaria acus, *Watson*	1,000
Acirsa prælonga	1,450
Aporrhais serresianus, *Mich*	1,230
Cerithium procerum, *Jeffreys*	1,450
Rissoa subsoluta, *Aradas*	1,456
Natica affinis, *Gmelin*	1,100
,, radiata, *Watson*	1,000
,, sphæroides, *Jeffreys*	1,750
Dunkeria falcifera, *Watson*	1,075
Fenella elongata, *Watson*	1,000
Cithna tenella, *Jeffreys*	1,536
,, Adamsi, *Jeffreys.*	
Sequenzia formosa, *Jeffreys*	1,785
,, Ionica, *Watson*	1,000
,, carinata, *Jeffreys*	1,095
,, elegans, *Jeffreys*	1,095

	fms.
Ganessa pruinosa, *Jeffreys*	1,095
,, nitidiuscula, *Jeffreys*	1,095
Tharsis Romettensis, *Sequenza*	1,095
Cyclostrema basistriatum, *Jeffreys*	1,095
,, affine, *Jeffreys*	1,095
Mölleria costulata, *Möller*	1,095
Trochus Wiseri, *Calcara*	1,456
,, tiara, *Watson*	1,075
,, Ottoi, *Philippi*	1,095
,, euspira, *Dall*	1,095
,, lima, *Watson*	1,000
,, infundibulum, *Watson*	1,075
,, scintillans, *Watson*	1,075
Scissurella umbilicata, *Jeffreys*	1,095
,, crispata, *Fleming*	1,095
,, tenuis, *Jeffreys*	1,450
Puncturella Noachina, *Linn.*	1,095
,, brychia, *Watson*	1,340
Rimula Asturiana, *P. Fischer*	1,121
Fissurisepta papillosa, *Sequenza*	1,095
,, rostrata, *Sequenza*	1,095
,, profundi, *Jeffreys*	1,450
Propilidium ancyloides, *Forbes*	1,450
,, pertenue, *Jeffreys*	1,095
,, compressum, *Jeffreys*	1,095
Chiton rarinota, *Jeffreys*	1,095
Cadulus gracilis, *Jeffreys*	1,095
,, Olivi, *Scacchi*	1,450
,, tumidosus, *Jeffreys*	1,450
,, cylindratus, *Jeffreys*	1,476
,, Jeffreysi, *Monterosato*	1,125
Siphonodentalium vitreum, *M. Sars*	1,450
,, teres, *Jeffreys*	1,095
,, affine, *M. Sars*	1,450
,, Lofotense, *M. Sars*	1,750
,, quinquangulare, *Forbes*	1,230
Dentalium agile, *M. Sars*	1,963
,, candidum, *Jeffreys*	1,750
,, filum, *G. B. Sowerby*	1,093
,, subterfissum, *Jeffreys*	1,476
,, capillosum, *Jeffreys*	1,785
,, ensiculus, *Jeffreys*	1,785
,, vagina, *Jeffreys*	1,785

	fms.
Xylophaga dorsalis, *Turton*	1,522
Saxicava rugosa, *Linn.*	1,622
Neæra obesa, *Lovén*	1,536
,, rostrata, *Spengler*	1,095
,, bicarinata, *Jeffreys*	1,095
,, teres, *Jeffreys*	1,095
,, depressa, *Jeffreys*	1,095
,, contracta, *Jeffreys*	1,095
,, semistrigosa, *Jeffreys*	1,095
,, ruginosa, *Jeffreys*	1,095
,, angularis, *Jeffreys*	1,785
,, papyrea, *Jeffreys*	1,450
,, curta, *Jeffreys*	1,095
,, notabilis, *Jeffreys*	1,450
,, striata, *Jeffreys*	1,450
,, exigua, *Jeffreys*	1,450
,, circinata, *Jeffreys*	1,450
Pecchiolia granulata, *Sequenza*	1,456
,, abyssicola, *M. Sars*	1,450
,, gibbosa, *Jeffreys*	1,450
,, subquadrata, *Jeffreys*	1,095
,, tornata, *Jeffreys*	1,785
,, insculpta, *Jeffreys*	1,263
,, acutecosta, *Phil.*	1,456
Pholadomya Lovéni, *Jeffreys*	1,456
Lyonsia formosa, *Jeffreys*	1,456
Tellina balaustina, *Linn.*	1,230
Abra nitida, *Müller*	2,435
,, longicallis, *Scacchi*	1,522
Montacuta ferruginosa, *Montagu* (? drifted)	1,960
,, Dawsoni, *Jeffreys*	1,750
,, bidentata, *Montagu* (? drifted)	1,230
Kelliella miliaris, *Philippi*	1,785
Kellia symmetros, *Jeffreys*	1,750
Axinus eumyarius, *M. Sars*	1,100
,, Cronlinensis, *Jeffreys*	1,012
,, ferruginosus, *Forbes*	1,012
,, cycladius, *S. Wood*	1,750
,, flexuosus, *Montagu* var. rotunda	1,095
,, incrassatus, *Jeffreys*	1,785
,, tortuosus, *Jeffreys*	1,012
,, subovatus, *Jeffreys*	1,408
Diplodonta Torelli, *Jeffreys*	1,450

	fms.
Poromya rotundata, *Jeffreys*	1,450
Venus ovata, *Pennant*	1,083
Astarte compressa, *Montagu* var.	2,000
,, borealis, *Chemnitz*	1,450
Limopsis aurita, *Jeffreys*	1,100
,, tenella, *Jeffreys*	1,450
,, cristata, *Jeffreys*	1,693
Silicula fragilis, *Jeffreys*	1,215
Glomus nitens, *Jeffreys*	1,750
Malletia excisa, *Jeffreys*	1,750
,, cuneata, *Jeffreys*	1,750
Leda tenuis, *Philippi*	1,456
,, messinensis, *Sequenza*	1,750
,, expansa, *Jeffreys*	1,750
,, arctica, *Gray*	1,333
,, pustulosa, *Jeffreys*	1,470
,, lucida, *Lovén*	1,011
,, frigida, *Torell*	1,360
,, pusio, *Philippi*	1,750
,, intermedia, *M. Sars*	1,333
,, micrometrica, *Sequenza*	1,456
,, insculpta, *Jeffreys*	1,095
,, sericea, *Jeffreys*	1,450
,, Jeffreysi, *Hidalgo*	1,785
,, striolata, *Jeffreys*	1,095
,, minima, *Jeffreys*	1,095
Nucula tumidula, *Malm*	1,456
,, cancellata, *Jeffreys*	1,470
,, striatissima, *Sequenza*	1,095
,, corbuloides, *Sequenza*	1,536
,, sulcata, *Brown*	1,522
,, ægeensis, *Forbes*	1,536
Arca pectunculoides, *Scacchi*	1,568
,, glacialis, *Gray*	1,622
,, Frielei, *Jeffreys*	1,333
Idas argenteus, *Jeffreys*	1,450
Dacrydium vitreum, *Möller*	2,435
Modiolaria discors, *Linn.*	1,785
Crenella decussata, *Montagu*	1,750
Modiola lntea, *Fischer*	1,088
Lima gibba, *Jeffreys*	1,785
,, subauriculata, *Montagu*	1,456
,, ovata, *S. V. Wood*	1,450

	fms.
Lima subovata, *Jeffreys*	1,450
Amussium fenestratum, *Forbes*	2,435
,, Hoskynsi, *Forbes*	1,456
,, lucidum, *Jeffreys*	1,450
Pecten fragilis, *Jeffreys*	1,750
,, Grœnlandicus, *G. B. Sowerby*	1,785
Waldheimia cranium, *Müller*	1,011
,, tenera, *Jeffreys*	1,450
Terebratula tuberata, *Jeffreys*	1,093
,, vitrea, *Born*	1,522
,, caputserpentis, *Linn.*	1,180
Atretia gnomon, *Jeffreys*	2,400
Discina Atlantica, *King*	2,400

POLYZOA.*

Menipea clausa, *Busk*	1,675
Canda simplex, *Busk*	1,700
Bugula reticulata, var. unicornis, *Busk*	2,175
Kinctoskias cyathus, *Wyv. Thomson*	1,585
Farciminaria gracilis, *Busk*	1,675
,, delicatissima, *Busk*	2,750
Bifaxaria minuta, *Busk*	1,675
Tessaradoma gracile, *M. Sars*	1,121

CRUSTACEA.

Galathodes acutus, *A. M. Edw.*	1,033
Rhachocaris sculpta, *Smith*	1,186
,, longirostris, *Smith*	1,047
Miersia Agassizii, *Smith*	1,047
,, gracilis, *Smith*	1,632
Acanthophyra purpurea, *A. M. Edw.*	1,438
Eumiersia ensifera, *Smith*	1,394
Meningodora mollis, *Smith*	1,632
Hymenodora glacialis, *Bucholz*	1,861
Bythocaris Payeri, *Heller*	1,081
,, leucopis, *G. O. Sars*	1,110
Sergestes robustus, *Smith*	1,632
Boreomysis scyphops, *G. O. Sars*	1,110
,, microps, *G. O. Sars*	1,250
Pseudomysis abyssi, *G. O. Sars*	1,110
Gnathophausia gigas, *Suhm*	2,200

*I am indebted to the kindness of Professor Busk for the information which has enabled me to include the Polyzoa in this list.

	fms.
Gnathophausia zoea, *Suhm*	1,000
Eucopia australis, *Dana*	1,250
Diastylis polaris, *G. O. Sars*	1,163
,, stygia, *G. O. Sars*	2,600
,, armata, *Norman*	1,750
,, lævis, *Norman*	1,630
,, biplicata, *G. O. Sars*	1,630
,, cornuta, *Boeck*	1,476
,, Calveri, *Norman*	1,630
Spencebatea abyssicola, *Norman*	1,360
Endorella hirsuta, *G. O. Sars*	1,380
,, truncatula, *Bate*	1,443
Iphinoe serrata, *Norman*	1,443
Leucon longirostris, *G. O. Sars*	1,750
,, serratus, *Norman*	1,750
Cyclaspis longicaudata, *G. O. Sars*	1,450
Apseudes simplicirostris, *Norman & Stebbing*	1,263
,, gracilis, *Norman & Stebbing*	1,785
,, cœca, *Suhm*	1,000
Sphyrapus anomalus, *G. O. Sars*	1,215
Anceus stygius, *G. O. Sars*	1,215
Anthura abyssorum, *Norman & Stebbing*	1,750
,, producta, *Norman & Stebbing*	1,450
Paranthura brachiata, *Thompson*	1,360
Astacilla longicornis, *Sowerby*	1,230
Chiridotea megalura, *G. O. Sars*	1,710
Nannoniscus bicuspis, *G. O. Sars*	1,163
Eurycope cornuta, *G. O. Sars*	1,215
Ilyarachna hirticeps, *G. O. Sars*	1,215
Ischnosoma bispinosum, *G. O. Sars*	1,090
,, quadrispinosum, *G. O. Sars*	1,360
Macrostylis spinifera, *G. O. Sars*	1,785
,, parallela, *Norman & Stebbing*	1,750
Hippomedon abyssi, *Göes*	1,215
Anonyx (Triphosa) pusillus, *G. O. Sars*	1,004
,, Hölbollii, *Kröyer*	2,435
,, (Hippomedon?) calcaratus, *G. O. Sars*	1,200
,, typhlops, *G. O. Sars*	1,760
Harpinia abyssi, *G. O. Sars**	
,, crenulata, *Boeck*	1,215
Monoculodes Packardi, *Boeck* (?)	1,215

*"In maximo abysso areæ frigidæ ubique frequens."—G. O. Sars.

	fms.
Lilljeborgia fissicornis, *M. Sars*	1,215
Œdiceros macrocheir, *G. O. Sars*	1,004
Tritropis (?) appendiculata, *G. O. Sars*	1,280
Melita pallida, *G. O. Sars*	1,333
Neohela monstrosa, *Boeck*	1,215
Podocerus longicornis, *G. O. Sars*	1,110
Pontocypris faba, *Reuss*	2,833
Bairdia Milne-Edwardsii, *G. S. Brady*	1,070
,, foveolata, *G. S. Brady*	1,070
,, acanthigera, *G. S. Brady*	1,070
,, victrix, *G. S. Brady*	1,425
,, angulata, *G. S. Brady*	2,833
Cythere dasyderma, *G. S. Brady*	2,740
,, dictyon, *G. S. Brady*	2,750
,, acanthoderma, *G. S. Brady*	2,750
,, irpex, *G. S. Brady*	2,833
,, serrulata, *G. S. Brady*	1,125
,, Speyeri, *G. S. Brady*	1,150
Krithe producta, *G. S. Brady*	1,675
Loxoconcha Africana, *G. S. Brady*	1,070
Xestoleberis variegata, *G. S. Brady*	1,070
Cytheropteron mucronulatum, *G. S. Brady*	2,050
Cypridina gracilis, *G. S. Brady*	1,000
Euchæta atlantica, *Lubbock* (?)	1,215
Scalpellum striolatum, *G. O. Sars*	1,081
,, regium, *Wyv. Thomson*	2,850
Sylon hymenodoræ, *G. O. Sars*	1,862

PANTOPODA.

Ascorhynchus abyssi, *G. O. Sars*	1,539
Colossendeis minuta, *Hoek*	1,250
,, Villegentei, *A. M. Edw.*	1,065
Phoxichilidium oscitans, *Hoek*	1,675

ANNELIDA.

Paramphithoe pulchella, *Ehlers*	1,215
Polynoe Sarsii, *Kinberg*	1,081
,, globifera, *G. O. Sars*	1,110
Antinoe Sarsii, *Kinberg*	1,215
Aleutia gelatinosa, *M. Sars*	1,366
Praxilla prætermissa, *Malmgren*	1,100
Leanira hystricis, *Ehlers*	1,443
Syllis abyssicola, *Ehlers*	1,380

	fms.
Nereis longissima, *Malmgren*	1,366
Lumbrinereis fragilis, *Müller*	1,380
Typhlonereis gracilis, *Hansen*	1,215
Gonida maculata, *Œrsted*	1,215
Glycera capitata, *Œrsted*	1,100
Prionospio Steenstrupii, *Malmgren*	1,785
Scolophos armiger, *Müller*	1,100
Aricia Kupfferi, *Ehlers*	1,366
Ammotrypane aulogaster, *H. Rathke*	1,380
Tachytrypane Jeffreysii, *McIntosh*	1,100
,, arctica, *McIntosh*	1,785
Sphærodorum abyssorum, *Hansen*	1,081
Trophonia glauca, *Malmgren*	1,380
Notomastus latericeus, *M. Sars*	1,443
Maldane Sarsii, *Malmgren*	1,081
Myriothele Heeri, *Malmgren*	1,380
,, Sarsii, *Hansen*	1,081
,, globifera, *G. O. Sars*	1,110
Samatha sexcirrata, *M. Sars*	1,081
Melinna cristata, *M. Sars*	1,366
Owenia filiformis, *D. Ch.*	1,788
Trichobranchus glacialis, *Malmgren*	1,450
Terebellides Strömii, *M. Sars*	1,215
Potamilla Malmgreni, *Hansen*	1,215
,, neglecta, *M. Sars*	1,110
Protula arctica, *Hansen*	1,163
Ditrypa Grœnlandica, *McIntosh*	1,450

GEPHYREA.

Phascolosoma Lilljeborgii, *Dan. & Kor.*	1,215
Onchnesoma glaciale, *Dan. & Kor.*	1,004
Priapuloides typicus, *Kor. & Dan.*	1,004
Saccosoma vitreum, *Dan. & Kor.*	1,163

ECHINODERMATA.

Irpa abyssicola, *Dan. & Kor.*	1,250
Kolga nana, *Theel*	1,250
,, hyalina, *Dan. & Kor.*	1,200
Acanthotrochus mirabilis, *Dan. & Kor.*	1,110
Elpidia nana, *Theel*	1,250
Euphronides depressa, *Theel*	1,090
Benthodytes typica, *Theel*	1,090
Echinocucumis typica, *M. Sars*	2,435

	fms.
Aërope rostrata, *Wyv. Thomson*	1,750
Brissopsis lyrifera, *Agassiz*	2,435
Homolampas fragilis, *A. Agassiz*	1,920
Calymne relicta, *Wyv. Thomson*	2,650
Pourtalesia miranda, *A. Agassiz*	1,215
,, phiale, *Wyv. Thomson*	1,975
Echinus elegans, *Dub. & Koren*	1,350
,, Norvegicus, *Dub. & Koren*	2,435
,, Wallisi, *A Agassiz*	1,047
Centrostephanus longispinus, *Pet.*	1,090
Phormosoma uranus, *Wyv. Thomson*	1,525
,, Sigsbeii, *A. Agassiz*	1,242
,, Petersi, *A. Agassiz*	1,224
Salenia hastigera, *A. Agassiz*	1,850
,, rarispina, *A. Agassiz*	1,675
Hymenaster pellucidus, *Wyv. Thomson*	1,495
,, anomalus, *Sladen*	1,425
,, membranaceus, *Wyv. Thomson*	1,125
Porcellanaster cœruleus, *Wyv. Thomson*	1,350
Tylaster Willei, *Dan. & Kor.*	1,200
Bathybiaster pallidus, *Dan. & Kor*	1,180
Goniopecten Edwardsii, *Perrier*	1,357
Hoplaster spinosus, *Perrier*	2,336
Caulaster pedunculatus, *Perrier*	1,000
Pedicellaster sexradiatus, *Perrier*	2,336
Archaster Andromeda, *Müll. & Trod.*	1,090
,, bifrons, *Wyv. Thomson*	1,090
Astrogonium longimanum, *Wyv. Thomson*	1,090
Brisinga endacaenemos	1,350
Zoroaster ,,	1.350
Ophiernis vallincola, *Lyman*	1,000
Ophioglypha lepida, *Lyman*	1,240
,, bullata, *Wyv. Thomson*	2,850
Ophiocten hastatum, *Lyman*	1,000
,, sericeum, *Forbes*	2,435
Ophiomusium armigerum, *Lyman*	1,650
,, Lymani, *Wyv. Thomson*	1,250
Ophiactis canotia, *Lyman*	1,000
Amphiura Otteri, *Ljungman*	1,250
,, duplicata, *Lyman*	1,075
,, Verrilli, *Lyman*	2,650
Amphilepis Norvegica, *Ljungman*	1,350
Ophiacantha bidenlata, *Retzius*	1,350

	fms.
Ophiacantha segestes, *Lyman*	1,075
Ophiomitra chelys, *Lyman*	1,525
Ophiogeron edentulus, *Lyman*	1,000
Ilycrinus Carpenteri, *Dan. & Kor.*	1,495
Bathycrinus gracilis, *Wyv. Thomson*	2,475

Hydrozoa.

? Ptychogena pinnatula, *Haeckel*	1,250
? Pectyllis arctica, *Haeckel*	1,250
? Cunarda æginoides, *Haeckel*	1,675
Stephanoscyphus	1,875

Actinozoa.

Stephanactis abyssicola, *Moseley*	1,350
Caryophyllea communis, *Sequenza*	1,250
Deltocyathus Italicus, *M. Edw. & Haime*	1,075
Stephanotrochus diadema, *Moseley*	1,009
,, nobilis, *Moseley*	1,000
Flabellum angulare, *Moseley*	1,250
,, alabastrum, *Moseley*	1,000
Bathyactis symmetrica, *Moseley*	2,900
Anthoptilon Murrayi, *Kölliker*	1,250
Umbellula Guntheri, *Kölliker*	1,850
,, Thomsoni, *Kölliker*	2,125
Protoptilon aberrans, *Kölliker*	1,700
Kophobelemmon stelliferum, *Müller*	1,055

Porifera.

Euplectella suberea, *Wyv. Thomson*	1,090 and 2,336
Lefroyella decora, *Wyv. Thomson*	1,600

Although a large number of Sponges have been found in the deepest water, they have not yet been described.

Foraminifera.*

Biloculina ringens, *Lamk.*, '*Valorous*,' Stat. 16	1,785
,, bulloides, *D'Orb.*	2,750
,, comata, *H. B. Brady*, '*Valorous*,' Stat. 12	1,456

* This list of Foraminifera is drawn up partly from information kindly supplied to me by Mr. H. B. Brady respecting the results of the dredgings of the '*Porcupine*' and '*Challenger*,' and partly from my own examination of '*Porcupine*' dredgings, and of the dredgings of H.M.S. '*Valorous*' in 1875. The arrangement and nomenclature is that which will be employed by Mr. Brady in his forthcoming splendid Monograph on this class. As no list has yet been published of the '*Valorous*' Deep Water Foraminifera. I

	fms.
Biloculina depressa, *D'Orb*, '*Valorous*,' Stat. 9.....	1,750
,, ,, var. murrhyna Schwager	1,230
,, elongata, *D'Orb*, '*Valorous*,' Stat. 16	1,785
,, sphæra, *D'Orb*	1,000
Spiroloculina tenuis, *Czjzek*, '*Valorous*,' Stat. 12	1,450
Miliolina tricarinata, *D'Orb*, '*Valorous*,' Stat. 12	1,450
,, seminulum, *Linn.*, '*Valorous*,' Stat. 12	1,450
,, insignis, *H. B. Brady*, '*Valorous*,' Stat. 9...	1,750
,, venusta, *Karrer*	2,750
,, Auberiana, *D'Orb*	2,435
Ophthalmidium inconstans, *H. B. Brady*	1,000
Planispirina celata, *Costa*, '*Valorous*,' Stat. 12.....	1,450
,, contraria, *D'Orb*	1,675
Cornuspira foliacea, *Philippi*	1,470
,, involvens, *Reuss*, '*Valorous*,' Stat. 12 ...	1,456
Orbitolites tenuissimus, *Carpenter*, '*Valorous*,' Stat. 7	1,100
,, ,, ,, ,, Stat. 12	1,456
Astrorhiza crassatina, *H. B. Brady*, '*Valorous*,' Stat. 9	1,750
,, catenata, *Norman*, '*Valorous*,' Stat. 9	1,750
,, granulosa, *H. B. Brady*.....	1,000
,, angulosa, *H. B. Brady*	1,000
Pelosina rotundata, *H. B. Brady*.....	1,675
Pilulina Jeffreysii, *Carpenter*	1,476
Technitella melo, *Norman*	1,215
Saccammina socialis, *H. B. Brady*	1,263
Hyperammina ramosa, *H. B. Brady*	1,000
,, vagans, *H. B. Brady*	1,230
Rhabdammina abyssorum, *M. Sars*, '*Valorous*,' Stat. 9	1,750
,, cornuta, *H. B. Brady*	1,215
,, discreta, *H. B. Brady*, '*Valorous*,' St. 12	1,450
Aschemonilla scabra, *H. B. Brady*	1,000
Rhizammina algæformis, *H. B. Brady*	2,435
Haliphysema confertum, *Norman*, '*Valorous*,' Stat. 9..	1,750
Reophax scorpiurus, *Montfort*, '*Valorous*,' Stat. 16...	1,785
,, difflugiformis, *H. B. Brady*	2,435

have intimated these more carefully by adding the Station at which the species was found. The following is a statement of the Stations where the '*Valorous*' dredgings were conducted in a greater depth than 1,000 fathoms.

Stat. 7.—Lat. 63° 10′ N., Long. 56° 43′ W., 1,110 f....Clay-Mud.

,, 9.—Lat. 59° 10′ N., Long. 50° 25′ W., 1,750 f....Mud (blue clay under).

,, 12.—Lat. 56° 11′ N., Long. 37° 41′ W., 1,450 f....Globigerina Ooze.

,, 16.—Lat. 55° 10′ N., Long. 25° 58′ W., 1,785 f....Globigerina Ooze (blue clay under).

	fms.
Reophax fusiformis, *H. B. Brady*	1,443
,, pilulifera, *H. B. Brady*	2,435
,, nodulosa, *H. B. Brady*	2,750
,, adunca, *H. B. Brady*, '*Valorous*,' Stat. 9	1,750
,, bacillaris, *H. B. Brady*, '*Valorous*,' Stat. 9	1,750
,, cylindrica, *H. B. Brady*, '*Valorous*,' Stat. 9	1,750
,, dentaliformis, *H. B. Brady*, '*Valorous*,' St. 9	1,750
Haplophragmium agglutinans, *D'Orb*, '*Valorous*,' St. 9	1,750
,, foliaceum, *H. B. Brady*	2,750
,, globigiriniformis, *P. & J.*, '*Val.*' St. 9	1,750
,, latidorsatum, *Bornemann*, '*Val.*' St. 16	1,785
,, anceps, *H. B. Brady*, '*Val.*,' St. 16	1,785
,, scitulum, *H. B. Brady*, '*Valorous*,' Stat. 16	1,785
,, glomeratum, *H. B. Brady*	2,675
,, rotulatum, *H. B. Brady*	2,750
Placopsilina vesicularis, *H. B. Brady*	1,215
,, bulla, *H. B. Brady*	1,360
Thurammina papillata, *H. B. Brady*	1,360
Webbina clavata, *J. & P.*	1,000
Ammodiscus charoides, *J. & P.*	1,350
,, tenuis, *H. B. Brady*	1,350
,, gordialis, *J. & P.*	1,350
Hormosina globulifera, *H. B. Brady*, '*Valorous*,' St. 16	1,785
,, Normani, *H. B. Brady*, '*Valorous*,' Stat. 16	1,785
,, Carpenteri, *H. B. Brady*, '*Valorous*,' St. 16	1,785
,, ovicula, *H. B. Brady*	1,350
Trochammina trullissata, *H. B. Brady*, '*Valorous*,' St. 9	1,750
,, ringens, *H. B. Brady*, '*Valorous*,' St. 9	1,750
,, galeata, *H. B. Brady*	2,675
,, pauciloculata, *H. B. Brady*	1,000
,, squamata, *P. & J.*	1,443
Cyclammina cancellata, *H. B. Brady*, '*Valorous*,' St. 12	1,450
Textularia gramen, *D'Orb*	1,630
,, sagittula, *Defrance*	1,240
,, agglutinans, *D'Orb*	1,000
Verneuilina polystropha, *Reuss*, '*Valorous*,' Stat. 12	1,450
,, pygmæa, *Egger*	1,675
,, propinqua, *H. B. Brady*	1,000
Tritaxia lepida, *H. B. Brady*	1,240
Gaudryina pupoides, *D'Orb*, '*Valorous*,' Stat. 16	1,785
,, baccata, *Schwager*, '*Valorous*, Stat. 16	1,785
,, siphonella, *Reuss*	2,435

	fms.
Bulimina elegans, *D'Orb*	1,630
,, ,, var. exilis, *H. B. Brady*	1,443
,, pyrula, *D'Orb*	1,443
,, ovata, *D'Orb*.....	1,350
,, pupoides, *D'Orb*	1,000
,, aculeata, *D'Orb*.....	1,630
,, inflata, *Sequenza*	1,443
,, Buchiana, *D'Orb*	1,675
Virgulina Schreibersü, *Czjzek*, '*Valorous*,' Stat. 16 ...	1,785
Bolivina lævigata, *D'Orb*, '*Valorous*,' Stat. 12.....	1,450
,, plicata, *D'Orb*, '*Valorous*,' Stat. 12	1,450
Cassidulina lævigata, *D'Orb*, '*Valorous*,' Stat. 12.....	1,450
,, subglobosa, *H. B. Brady*	1,443
,, Bradyi, *Norman*	2,750
,, crassa, *D'Orb*	2,750
Chilostomella ovoidea, *Reuss*	1,350
Lagena lævis, *Montagu*, '*Valorous*,' Stat. 12	1,450
,, hispida, *Reuss*, '*Valorous*,' Stat. 7.....	1,100
,, ,, ,, ,, Stat. 12	1,450
,, semistriata, *Will*, '*Valorous*,' Stat. 7.....	1,100
,, ,, ,, ,, Stat. 12	1,450
,, gracillima, *Sequenza*.....	2,650
,, staphyllearia, *Schwager*	2,750
,, formosa, *Schwager*	2,435
,, Orbigniana, *Sequenza*	2,675
,, globosa, *W. & B.*.....	2,675
,, auriculata, *H. B. Brady*..... ..	2,750
,, fimbriata, *H. B. Brady*	2,750
,, squamoso-alata, *H. B. Brady*	1,443
,, striato-punctata, *P. & J.*.....	2,750
,, stellata, *H. B. Brady*	2,750
,, melo, *D'Orb*, '*Valorous*,' Stat. 7	1,100
,, seminiformis, *Schwager*	1,000
,, marginata, *W. & B.*, '*Valorous*, Stat. 12	1,450
,, trigono-marginata, *P. & J.*.....	1,360
,, lævigata, *Reuss*.....	2,533
Nodosaria scalaris, *Batsch*, '*Valorous*,' Stat. 9	1,750
,, ,, ,, ,, Stat. 12.....	1,450
,, ,, ,, ,, Stat. 16.....	1,785
,, radicula, *Linn.*.....	1,340
,, soluta, *Reuss*, '*Valorous*,' Stat. 7	1,100
,, Rœmeri, *Neugeboren*, '*Valorous*,' Stat. 9 ...	1,750
,, ,, ,, ,, Stat. 16 ...	1,785

	fms.
Nodosaria communis, *D'Orb*, '*Valorous*,' Stat. 7	1,100
Glandulina lævigata, *D'Orb*, '*Valorous*,' Stat. 12	1,450
,, ,, ,, ,, Stat. 16.....	1,785
Frondicularia inæqualis, *Costa*.....	1,240
Marginulina costata, *Batsch*.....	1,240
,, glabra, *D'Orb*	1,350
Rhabdogonium tricarinatum, *D'Orb*	1,360
Vaginulina legumen, *Linn.*, '*Valorous*,' Stat. 12	1,450
,, linearis, *Montagu*, '*Valorous*,' Stat. 12 ...	1,450
Cristallaria cultrata, *Montfort*, '*Valorous*,' Stat. 12...	1,450
,, variabilis, *Reuss*.....	1,630
,, gibba, *D'Orb*	1,240
,, acute auricularis, *F. & M.*.....	2,750
,, rotulata, *Lamk*	1,350
,, compressa, *D'Orb*	1,000
Polymorphina lanceolata, *Reuss*, '*Valorous*,' Stat. 9...	1,750
,, elegantissima, *D'Orb*.....	2,675
,, longicollis, *H. B. Brady*	2,435
,, Orbignii, *Zborjewski*, '*Valorous*,' Stat. 7	1,100
Uvigerina pygmæa, *D'Orb*, '*Valorous*,' Stat. 12	1,450
,, angulosa, *Will*, '*Valorous*,' Stat. 12.....	1,450
,, asperula, *Czjzek*	1,240
Globigerina inflata, *D'Orb*, '*Valorous*,' Stat. 12.....	1,450
,, bulloides, *D Orb*, '*Valorous*,' Stat. 9	1,750
,, pachyderma, *Ehrenberg*, '*Valorous*,' Stat. 9	1,750
,, dubia, *Egger*	1,350
,, rubra, *D'Orb*	1,240
,, conglobata, *H. B. Brady*	1,350
,, æquilateralis, *H. B. Brady*	1,675
,, Dutertrei, *D'Orb*	2,020
Orbulina universa, *D'Orb*, '*Valorous*,' Stat. 16.....	1,785
,, porosa, *Terquem*, '*Valorous*,' Stat. 9	1,750
Pullenia quinqueloba, *Reuss*, '*Valorous*,' Stat. 16	1,785
,, sphæroides, *D'Orb*	1,240
,, obliqueloculata, *P. & J.*.....	2,750
Sphæroidina bulloides, *D'Orb*, '*Valorous*,' Stat. 9.....	1,750
,, ,, ,, ,, ,, 16.....	1,785
,, dehiscens, *P. & J.*.....	2,750
Candeina nitida, *D'Orb*, '*Valorous*,' Stat. 16.....	1,785
Spirillina vivipara, *Ehrenberg*	1,000
,, marginata, *H. B. Brady*	1,000
,, margaritifera, *Will.*, '*Valorous*,' Stat. 12 ...	1,450
Tinoporus lucidus, *H. B. Brady*, '*Valorous*,' Stat. 12...	1,450

	fms.
Polytrema miniaceum, *Linn.*	1,000
Truncatulina lobatula. *Walker*, '*Valorous*,' Stat. 12...	1,450
,, refulgens, *Montfort*, '*Valorous*,' Stat. 12	1,450
,, Wüllustorfii, *Schwager*	1,476
,, ariminensis, *D'Orb*	1,360
,, grosserugosa, *Gümbel*	1,000
,, humilis, *H. B. Brady*	2,750
,, Ungeriana, *D'Orb*, '*Valorous*,' Stat. 12...	1,450
,, ,, ,, ,, ,, 16...	1,785
,, Robertsoniana, *H. B. Brady*, '*Valorous*,' Stat. 12, 1,450; 16...	1,785
,, Haidingerii, *D'Orb*	2,754
,, pygmæa, *Hantken*	2,675
Pulvinulina repanda, *F. & M.*	1,000
,, concentrica, *P. & J.*	1,000
,, Menardii, *D'Orb*	2,675
,, tumida, *H. B. Brady*	2,675
,, Partschiana	1,240
,, canariensis, *D'Orb*, '*Valorous*,' Stat. 12...	1,450
,, ,, ,, ,, ,, 16...	1,785
,, crassa, *D'Orb*	1,360
,, Karsteni, *Reuss*	1,240
,, exigua, *H. B. Brady*	2,435
,, pauperata, *P. & J.*, '*Valorous*,' Stat. 12...	1,450
,, ,, ,, ,, ,, 16...	1,785
,, Micheliniana, *D'Orb*, '*Valorous*,' Stat. 12...	1,450
,, ,, ,, ,, ,, 16...	1,785
Rotalia Soldanii, *D'Orb*, '*Valorous*,' Stat. 9, 1,750; 12, 1,450; 16	1,785
,, orbicularis, *D'Orb*, '*Valorous*,' Stat. 9	1,750
Nonionina umbilicata, *Montagu*, '*Valorous*,' Stat. 9 ...	1,750
,, ,, ,, ,, 12...	1,450
,, pompilloides, *F. & M.*, *Valorous*,' Stat. 9...	1,750
,, ,, ,, ,, ,, 12...	1,450
,, scapha, *F. & M.*	1,340
,, turgida, *Will.*	1,340
Polystomella striatopunctata, *F. & M.*	1,240

The following gentlemen were elected members of the Tyneside Naturalists' Field Club during the year 1880:—

At the Anniversary Meeting, April 15th:—Hill Motum, Helensville, Grainger Park Road; John Ford Maling, 14, Ellison Place; H. T. Archer, 14, Lovaine Place; John Bell, 28, Burdon Terrace; George Charlton, Chester Street, Newcastle; William Hutchinson, Roseworth Villas, Gosforth; Wm. J. Bone, 61, Linskill Street, North Shields.

At the First Field Meeting, Hexham, May 17th:—George Clarke, 22, Belgrave Terrace; A. M. Fowler, Tankerville Terrace; A. H. Higginbottom, 4, Percy Terrace; William Hardie, Osborne Road, West Jesmond, Newcastle; Henry Strachan, 3, Villa Place, Union Lane; Rev. Thos. Haslewood, St. Edmund's Vicarage; Edwd. Shewbrook, 49, West Street, Gateshead; Jas. Cole, Walker-on-Tyne; Thomas Maw, Wallace Terrace, Ryton-on-Tyne; Thos. Gilchrist, Ovington Cottage, Ovington-on-Tyne; William Graham, Lovaine Terrace, North Shields; Wm. Young Veitch, 37, Grange Road, Middlesbro'.

At Alston, June 23rd:—Rev. Charles Duppuy, 58, Maple Street; John Burrell, Lower Condercum, Newcastle; Alfred Fell, James F. Stark, and Thos. W. Stuart, Hebburn-on-Tyne; Rev. W. J. Wright, Hendon, and A. H. Robson, 2, Esplanade, Sunderland.

At Marsden, October 1st:—John Straker Wilson, 23, Grey Street, and Andrew Ross, Dean Street, Newcastle; Jacob Lawson, Dunston, Gateshead; John Moffat, Linskill Terrace, and R. T. Wright, Linskill Terrace, North Shields; Thos. Pinkney, Cresswell Villa, Sunderland.

THE TREASURER IN ACCOUNT WITH THE TYNESIDE NATURALISTS' FIELD CLUB.

FROM JANUARY 1ST TO DECEMBER 31ST, 1880.

1879.	Dr.	£	s.	d.
Jan.	To Balance brought forward	78	1	5
	,, Subscriptions	131	5	0
	,, Sale of Transactions	7	16	6
		£217	2	11

1879.	Cr.	£	s.	d.
	By Commission on Collecting ..	7	1	3
	,, Printing Circulars and Post	30	10	9
	,, ,, Transactions	96	0	4
	,, Secretaries' Expenses.....	12	14	6
	,, Anniversary Expenses	2	0	0
Dec. 31.	,, Balance	68	16	1
		£217	2	11

Signed,

J. S. FORSTER.

T. P. BARKAS.

The following gentlemen were elected officers of the Club for the year 1880–81:—

President.

E. I. J. Browell, Esq.

Vice-Presidents.

John Hancock, Esq.	Robert Vint, Esq.
John F. Spence, Esq.	James Clephan, Esq.

Ralph Carr Ellison, Esq.	E. J. J. Browell, Esq.
Rev. J. F. Bigge, M.A.	Rev. R. F. Wheeler, M.A.
D. Embleton, Esq., M.D.	Prof. G. S. Brady, M.D.
Rev. Canon Tristram, F.R.S.	H. B. Brady, Esq., F.R.S.
George Wailes, Esq.	Rev. J. E. Leefe, M.A.
Rev. A. M. Norman, M.A.	Rev. G. R. Hall, M.A., F.S.A.
Rev. J. C. Bruce, LL.D.	G. H. Philipson, Esq., M.D.
Rev. A. Bethune, M.A.	Rev. R. E. Hooppell, LL.D.

Treasurer.

Robert Y. Green.

Honorary Secretaries.

Richard Howse.	Thomas Thompson.

Committee.

D. O. Drewett.	T. W. Backhouse.
William Maling.	T. T. Clarke.
William Dinning.	John T. Thompson.
John Philipson.	Joseph Blacklock.
Edward C. Robson.	Rev. J. M. Hick.
John Glover.	Henry C. Abbs.

Auditors.

J. S. Forster.	T. P. Barkas.

VIII.—*A Voyage to Spitzbergen and the Arctic Seas.* By Abel Chapman, Esq., Silksworth Hall, Sunderland. With Four Plates.

The interest which has always attached to records of Arctic research has tempted me to write the following account of a brief visit to Spitzbergen, and the adjacent seas, in the summer of 1881.

An expedition to the Arctic regions was proposed in the spring of that year; but so little enterprise is there among travellers, that while "Cook" can draw his thousands to the beaten tracks of the Rhine or the Nile, or to rush "round the world in ninety days," the greatest difficulty was experienced in securing a mere handful who were willing to strike out a new line, and thereby reach some of the least-known and most sublime phenomena of Nature. These difficulties it is unnecessary to recount. Eventually, after a long period of doubt and uncertainty, they were surmounted, and on 12th July our small party embarked at North Shields, "than which," wrote a south-country member of tho expedition, "we encountered no more uncivilized looking region in all our travels, nor any in which the native language is more incomprehensible."

Leaving the Tyne in the s.s. "Johann Sverdrup," we joined our chartered steamer, the "Pallas," in Bergen, on 15th July. The latter, which was to be our ocean home for several weeks, was a commodious little vessel of 367 tons and 50 horse-power, giving a speed of nine knots.

Of our nine hundred mile voyage through the Norwegian fjords little need be said. They are doubtless well known to most of my readers. The mountain scenery is magnificent, especially about the wild Loffotens, but bird life is singularly deficient: Shags and Arctic Skuas in the south, family parties of Eider Ducks, and a few common sea-birds here and there were all we saw, save an occasional Eagle soaring high over the mountain peaks.

At Tromsö we stopped two days to fill up with coal and take in our stores of provisions, etc. Here also our ice-navigator,

Capt. Elling Carlsen, Knight of St. Olaf, etc., etc., joined the "Pallas." This veteran Arctic seaman, who in 1863 was the first circumnavigator of Spitzbergen, and of Novaya Zemlya in 1871, on the latter voyage discovered the remains of the Wilhelm Barentz Expedition of 1594, which had lain there unvisited and undisturbed, save by bears, for two hundred and seventy-seven years. Carlsen was also ice-pilot of the ill-fated Austrian Expedition, which in the "Tegethoff" involuntarily discovered Franz Josef Land in 1874. We also shipped two whale boats with their crews, under Kjeldsen and Johannesen, both names known in Arctic exploration; and, finally, had a "crow's nest" fitted to our fore-top mast.

During these preparations I utilised the time to visit the high fjelds above Tromsö, and in a wood of stunted birch found a colony of Fieldfares breeding. Most nests contained half-grown young (July 20th), but eventually I found one with five eggs, as well as two or three addled eggs in other nests, and two nests of the Mealy Redpole, *Linaria canescens*, with young. Ravens were numerous, and we also obtained a fine specimen of the White-tailed Sea-Eagle, *Haliäetus albicilla*, in immature plumage. Its claws having become inextricably fixed in the carcase of a dead Cod-fish on which it had gorged itself, it was unable to rise.

The sun at this point disappeared for about an hour at midnight, but there was no darkness whatever. The surface temperature of the water in the fjord varied from 49° to 51°, and we continued sea bathing up to this point.

On the 23rd we weighed anchor, and steaming through the inhospitable-looking northern fjords, entered the Arctic Sea, and shaped our course for Spitzbergen, distant four hundred and eighty miles North. Early next morning the peculiar pale yellow streak of light known as "ice-blink," low on the northern horizon, indicated the presence of ice in that direction; and at noon, latitude 72° 8″ north, we ran up to an extensive floe, extending east and west as far as the eye could reach. During the next twelve hours our course included almost every point of the compass; but we eventually cleared the ice, and next morning the desolate snow-clad mountains of Bear Island were in

sight, the lofty peak of "Mount Misery" bearing East distant about sixteen miles. The surface temperature of the sea had fallen to 32°, the air maximum, during twenty-four hours, 39°, minimum 33°. Birds were here abundant; Fulmar Petrels circled round the ship, gracefully gliding on motionless pinions, Kittiwakes following our course, ever chased by Skuas of at least two species, while strings of Brünnich's Guillemots whirled across our bows like driven Grouse. The heavy ice rendering a landing on Bear Island impracticable we steered N., and that evening encountered a fresh gale from N.E., with heavy sea.

Early next morning, July 26th, the South Cape of Spitzbergen was sighted, and the impressiveness of the scene from the decks of the "Pallas;" the grim grandeur of hopeless desolation conveyed to one's mind will never be forgotten by those who witnessed it. The day was foggy, and dense masses of grey mist appeared to fill each valley, while fleecy wreaths of it, only less white than the mantle of everlasting snow, obscured and encircled the mountain slopes. The barren grey rocks appeared wholly innocent of the faintest trace of colour or vegetation, and above the cloud stratum the sharp and lofty peaks stood out in bold jagged contour against the sky.

Steaming along the West coast, the entrance to Horn Sound was judged by our ice-pilots to be impassable on account of the masses of ice drifting outwards; nor did any better luck attend our intention of entering Bel Sound. The embouchure of that inlet was studded with hundreds of drifting ice-floes of the most varied and fantastic shapes, and the brilliancy of whose hollowed wave-eaten sides rivalled the hues of emerald, sapphire, and chrysolite. See Frontispiece. Round our ship gambolled "schools" of Black Bottle-nosed Whales, *Globiocephalus melas*, ? sp., and the scene was further enlivened by myriads of Auks, Petrels, Guillemots, and other sea-fowl.

Proceeding north the coast presented an almost unbroken series of glaciers. Each valley appeared to be occupied by one of these ice-streams. Central Spitzbergen seems to consist of one immense elevated plateau of palæocrystic ice, a "*mer de glace*," from which innumerable glaciers take their rise, winding a

sinuous course down the valleys, or cutting for themselves fresh channels to the sea. The sea-front of many of these glaciers was of great height, perhaps two hundred or three hundred feet sheer, and protruded some distance beyond the coast line. The whole coast swarmed with incalculable quantities of sea-fowl, and huge "Finner" Whales or Rorquals, *Balænoptera musculus*, were frequently descried. A good idea of the immense length of these leviathans was conveyed by the distance between the erect dorsal fin, the only part visible, and the point at which the spray, or "spouting" from their submerged nostrils rose from the sea. This distance often *appeared* to be at least fifty feet, which would give, roughly, a total length of perhaps seventy or eighty feet. Plate III.

At midnight on the 26th we steamed up the magnificent entrance to Ice Fjord, and anchored in a creek called Green Haven. The shores of this haven consisting chiefly of glaciers, bare rocks, or snow-covered hills, its name must have been chosen on the '*lucus a non lucendo*' principle. Here we commenced a series of more or less successful expeditions after Reindeer. These Deer are tolerably numerous in the open valleys, and spend the morning resting on the higher slopes of the hills, lying down as often on a patch of snow as on the drier ground. Towards afternoon (I need not remind my readers that there is no visible difference between midday and midnight) they come down into the valleys and lower ground, where they find abundant pasturage in the mosses and Arctic vegetation, which springs up rapidly in the short summer. The Reindeer were very fearless, and took little or no notice of the report of a rifle, provided the sportsman kept well out of sight. They probably mistook it for the sounds caused by the cracking and splitting of the glaciers, noises which ceaselessly reverberated around. One of our party assured me he fired, I think it was, eight or nine shots at four Bucks, and when one or two of them fell, the others coolly walked up and began sniffing curiously at the bodies of their late companions. I noticed the same indifference in the Arctic Ptarmigan, *Lagopus hemileucurus*, of which bird I fell in with four on our first landing. They sat down on a steep moraine, where I

killed them all, without one attempting to take wing. The first day's stalking in a broad valley running east from Green Haven produced five Deer, all very fat and in high condition. Their colour was blueish-grey, with a lavender tinge. All their horns were in the velvet, and hundreds of the cast antlers lay scattered about in the bed of the small muddy torrent which flowed down the valley. Of birds seen inland Snow Bunting and Purple Sandpiper were most numerous, a nest of the latter, with four eggs, being also found to-day. On the fjord large numbers of Eider Ducks and sea-fowl were shot as an addition to our bill of fare, to which also numerous large Cod-fish caught by lines from the steamer formed a material contribution.

Other expeditions were made with varying success, and one strange fact in Arctic conditions forced itself rather painfully upon us. This was that the extreme rarification, or clearness of the atmosphere, practically abolished all appearance of distance, and caused the most extraordinary deceptions. Thus a row across a fjord, which appeared only a couple of hundred yards, would prove to be two or three miles, and hills, etc., at a distance of seven or eight miles appeared to be less than one. These deceptions sometimes entailed very severe work in the long inland expeditions. We now understood why the old Dutch navigators turned back in fear from a land which seemed ever near, yet took days to reach.

Geologically the formation of Western Spitzbergen is largely of the Carboniferous period. Strange as the fact may appear to a beholder of its ice-bound shores at the present day, there appears abundant evidence of their having in long-past ages luxuriated in the temperate clime and abundant flora of that epoch; and on several of the sounds outcrops of coal of good quality have been discovered. The hills consist largely of Sandstones and Dolomite, or Mountain Limestone, interspersed with Granite, and dykes of basaltic rock in vertical columns. But more strange still is the fact that the comparatively recent formations of the Miocene, a period almost unevidenced in the British Islands, appears to be largely represented in Spitzbergen on the east coast, though the intermediate periods seem to have left but

little record. However, as the dip of the strata trends eastward, and Central Spitzbergen is buried in heavy land ice, and therefore unknown, possibly some of the latter may outcrop in this unexplored region. Several instances of what we considered "raised beaches" were observed in the fjords.

Of the few lithological specimens brought home the majority were Limestones or Sandstones of the Carboniferous series, and all presented a singularly weather-worn appearance. There was also a concretionary nodule of Ironstone, and specimens of Mica-Schist and Granite. The following fossils obtained by us are all common to the Carboniferous rocks of Durham and Northumberland, and have been identified by my brother, A. Crawhall Chapman, mining engineer, viz., *Terebratula hastata, Spirifera striata, Producta semireticulata, and Lepidodendra.*

Many of the sea fronts of the hill ranges, the rocks being disintegrated by the severity of the climate, present steep smooth slopes, the sides of which are carved out by the action of ice and water into regular series of vertical buttresses. The singular uniformity of appearance thus presented somewhat resembles the work of the military engineer with his bastions, scarps and counter scarps ranged with mathematical accuracy.

Where the solid rock presents a vertical face, the narrow ledges of the horizontal strata are almost invariably occupied by countless myriads of Rock-birds, whose gigantic "Loomeries," or breeding places, are one of the wonders of Spitzbergen, by comparison dwarfing ours of Flambro' and the Farnes into the utmost insignificance. Many of these Loomeries are situated a considerable distance from the sea, and at elevations of a thousand to two thousand feet above it. These precautions are necessary to secure immunity from the numerous Arctic Foxes, but must greatly add to the labours of the parent birds in feeding their young.

After leaving Ice Fjord we continued our voyage northwards, and passing outside of Prinz Carl Foreland paid a short visit to King's Bay and Cross Bay, remarkable for the magnificent Arctic panorama they present. Thence we steamed to Magdalena Bay, in 79′ 35″ North lat. This is a mountain-encircled basin, its

shores lined with glaciers, and the whole scene enveloped in snow, save where ridges of black rocks stand out in sharply-defined contrast. Here we found the Norwegian whaling schooner "Hvitfisken," which had already secured a full cargo of two hundred and fifty White Whales, *Beluga catodon*,* said to be worth £1500. These animals abounded in the Bay. They are gregarious, and frequent the shallow muddy waters along the shore. The "Hvitfisk's" cargo also comprised a number of Seals, a quantity of Eider down, and last, not least, two Polar Bears, which had been shot by her crew in Bel Sound just before our arrival. They were unluckily the only examples of *Ursus maritimus* our expedition came across. The little vessel lay islanded among the floating skins of her prey, and surrounded by a struggling crowd of Fulmars, which quarrelled and fought over the blubber, most audaciously regardless of our presence within a few feet. They were easily caught alive by hook and line, but we were not equally successful with *Squalus Grænlandicus*, the Blind Shark, one or two of which were swimming round close to the surface, but which we failed to secure. We found no Reindeer here, the ground not being suitable, but on the low rocky foreshore shot several Grey Geese, *Anser brachyrhynchus*, which were breeding on the rugged talus at the base of the cliffs. Higher up Glaucous and Ivory Gulls were breeding on Rotge's Hill, but their nests were utterly inaccessible. This day was absolutely warm: the thermometer hung on the deck-house, registering over 80° in the sun; and we observed some small midges, the only insects seen in Spitzbergen. The surface temperature in the Bay was 32°. While stalking the Geese on the north shore I came across the remains of a rude wooden coffin, half buried in big stones. The place had evidently been explored by Bears, and all that remained of the poor whaler were a few metal buttons.

From here we again proceeded north, intending to double Verlegen Hook and reach Hinloopen Straits, where we were in high hopes of falling in with Walrus and Bear. But in this we were disappointed. Off Hakluyt's Headland we encountered

* *Delphinapterus leucas* (Pallas).

considerable masses of drift ice, the floes becoming gradually denser and more formidable as we advanced. Shortly afterwards, off Vogelsang Island, in 79′ 55″ north lat., the solid ice-barrier of the Polar Pack definitely arrested all further progress. The Pack, impinging on the land at Norske Oër, to the east of us, extended all round on the north, and thence trended south west, leaving only a narrow lane of open water. The spectacle presented from the masthead at this point was unspeakably grand. It was just midnight—one of those calm clear nights which are characteristic of the Arctic seas—and the cold bright rays of the northern sun lent a peculiar prismatic hue to the silent scene, beautifying all they touched. To the north, as far as eye could reach, lay, stretched in silently-defiant majesty, the rugged plains of Polar ice, here and there distorted and upheaved into ridges and hummocks, the threshold of the unknown region, impregnable hitherto even to the pluck and science of the nineteenth century. For all we could tell the ice was continuous to the Pole itself, within seven hundred miles of which we lay. On our starboard was Vogelsang: its black cliffs and snowy slopes reflected faultlessly in the rippleless sea, as in a mirror; while ice-floes of every conceivable shape studded the water around.

The Polar ice which now lay before us marks the summer limit of the Gulf-Stream influence. It marks the battle field of two great contending influences of Nature, one from the tropics, the other from the pole. The exact position of the ice-edge varies in different years to some extent. In open seasons, at irregular intervals, the sea is found to be clear of ice as far as the Seven Islands, in 80° 45″ north lat., or even much further, as in 1863, when Carlsen sailed round Nord-Ost-land, and circumnavigated Spitzbergen. But this is exceptional. The normal position of the permanent ice, at that season, appears to be pretty constant where we found it on that July night in 1881, just impinging on the N.W. corner of Spitzbergen. From near this point in 1827 Parry set out on his memorable attempt to reach the North Pole by sledging across the Pack, attaining an altitude of 82° 45″ north latitude.

The meridians of longitude being at this high northern point only some ten or a dozen miles in width, several of these ideal lines would naturally, in the clear northern atmosphere, fall within the range of our vision; and that our party was, at least, not oppressively scientific, was demonstrated by a report that one member had ascended to the "Crow's Nest," armed with a powerful binocular, in order to examine this phenomenon. Presumably, he expected to view a network of wires, something like what one sees branching away from a telephone exchange.

The surface temperature was 32°. Several Seals and the usual Arctic birds were observed. Our stay here was necessarily short, as considerations of safety made an immediate retreat imperative, lest the slowly-drifting ice should close up the narrow passage left behind us. Accordingly the order was given to 'bout ship, and with heavy hearts we steamed back to Magdalena Bay.

Thence the course of the "Pallas" was directed southwards to Bel Sound, where we anchored safely under "Middle Hook." This range of cliffs was of the typical Spitzbergen buttressed form, and its higher ridges were occupied by one of the most extensive Loomeries we met with, at an elevation of perhaps a thousand feet. The spectacle of the teeming, hurrying, clamouring throng of sea fowl eddying round the lofty summits, dwarfed by the altitude to mere specks, like ten thousand swarms of bees, beggars description. Ceaselessly, day and night, plied the multitudinous columns between crag and sea—the upward-bound files with gaping bills and a "cheekful" of Shrimps, intended for their young, but often destined to become the prey of their persecutors, the Arctic Skuas, *Stercorarius parasiticus,* which ever hovered overhead on piracy intent. The wild Babel-like medley of cries from the myriad throats in these cliffs, ceaselessly resounding from above in varying cadences, resembled the distant roar of a heavy sea, or, perhaps better, of an excited mob of the *ignobile vulgus* at election times. The buzzing and chattering of the Guillemots, the weird long-drawn "twirl" of the Auks, and the petulant "yapping" bark of numberless Arctic Foxes, each formed a distinctive component.

Bel Sound at this date, August 2nd, was full of masses of

"bay-ice," slowly drifting seawards, and here too swarmed the Rock-birds in bewildering profusion. Wherever the eye rested, there were the Alcadæan hordes. Ice, air, and sea equally were filled with them, hurrying past, swimming in black phalanxes, or sitting in serried ranks bolt upright on the ice.

We remained here some days, and obtained several Reindeer and Seals. Five of the former were shot one day in a valley off Axel Bay. In this latter Sound we witnessed a magnificent Arctic spectacle. The mouth of the inlet is almost closed by a small rocky island of upheaved vertical strata, and as the fast-ice in the upper waters broke up, the detached floes, drifting outwards, soon blocked the narrow outlet. Then the accumulating masses of ice imprisoned behind and propelled by a strong ebb drove irresistibly forward, and at the outlet a terrific struggle ensued. Piled up, block upon block, the roaring, grinding, crushing mass of congested ice was upheaved again and again, almost to the level of the low ridge where we sat, only to fall back each time with a crash like thunder. The background was appropriately formed by a huge "stratified" glacier, occupying all the opposite shore of the narrow channel. Only its grim and lofty front was visible to us, for, low on its green convex back rested a mass of dense grey cloud, while above this again rose the peaks of barren snow-streaked mountains. The whole spectacle formed one of Nature's most majestic scenes—utterly beyond my power to describe—and I lingered long in admiration, wishing, perhaps, that a grand climacteric might be added by the appearance of a Polar Bear on the scene. But it is only a step from the sublime to the ridiculous, for presently I was recalled by my "*compagnons de voyage*," who broadly rated me for my long absence, infamously suggesting that I had been making a secret descent on the "Bottled Beer" which lay in the boat! The ice struggle continued unabated till the slack of the tide, when we proceeded in our boat into the upper Sound in quest of Deer.

The Seals shot were of the Ringed species, *Phoca hispida*, and were killed either on the ice or in the water. In the latter case, the instantaneous arrival on the scene of the harpoon, as

supplementary to the bullet, was necessary to secure the victim. Several of the Great Bearded Seal, *Phoca barbata*, were also observed, but none secured, though one at least was killed. He rolled off the ice-edge, and sank before a harpoon could reach him.

Starting early one August morning, in a driving snowstorm, we succeeded in reaching the head of Van Keulen's Bay in Kjeldsen's whale boat. The upper waters swarmed with White Whales, but in the "choppy" sea Kjeldsen failed to "get fast." These Whales are always too active to be easily captured by the harpoon. Plate IV.

On the small rocky islands were great numbers of Brent Geese breeding. The Grey Geese here, as at Magdalena Bay, seemed to prefer the hill slopes of the mainland for incubation. This, the Norwegians stated, is because these large Geese are able to repel the attacks of the Arctic Foxes on their young, while the smaller Brent Geese are obliged to resort to the islands for safety. We saw many Seals in this Bay, but the water was too "lumpy" for accurate shooting. I killed one with a bullet from an ordinary 12-bore.

Leaving Bel Sound we returned to Ice Fjord to resume operations against the Deer; but our hopes of reaching the upper waters of the Sound were frustrated by ice, and we were unable to advance further than our former anchorage at Green Haven. Even here our progress was arrested by a barrier of drifted Bay-ice, through which the "Pallas" had to force a passage, crashing through ice a foot thick for a mile or so. In Green Haven we picked up the crew of a Norwegian whaling schooner, which had been caught in the ice, and lay stranded on the rocks at the entrance. Plate V.

One morning a Walrus was reported to have been seen among the loose ice in this fjord, the only instance of its occurrence on our expedition. This strange Arctic monster has now almost disappeared from the navigable seas of Western Spitzbergen. The wanton and indiscriminate persecution of the Norwegian whalers has gradually driven the Walrus back to the ice-bound

fastnesses of the eastern coast. These waters, not being influenced by the Gulf Stream, are seldom navigable, except in rare open seasons, and the Walrus there finds a secure retreat.

The "Right Whale," *Balæna mysticetus*, has in like manner disappeared from its former haunts on the west coast, where, in Scoresby's time, a valuable fishery was annually carried on. Not a single "right" Whale was seen by us, though the huge "Finners," or Rorqual, were of daily occurrence in the open sea, and the White Whales numerous in the Sounds.

The "Finners" are seldom molested by the Norwegian whalers. So enormous is their strength, and they are so vicious when attacked, that their capture, as a commercial venture, "does not pay." They yield a certain amount of oil, but the loss of lines and gear, not to mention lives, is hardly proportionate.

From Ice Fjord we weighed anchor on our homeward voyage, but I must not leave Spitzbergen without mentioning its wild flowers. Dwarfed and stunted as are their types by the ungenial climate, yet many possess really brilliant colours, which greatly relieve the desolate scenes. Most conspicuous are the Saxifrages, their bright red and purple petals forming perfect cushions of colour, while their spreading creepers extend for yards around. Then there are tiny star-shaped Flowerets, some white, others bright yellow; others again of the Buttercup shape, and a small species of Potentilla; but ignorance of botany prevents my giving names. On the stony slopes grew clusters of miniature Poppies, yellowish-white, with hairy stems, and high up on the hills in Ice Fjord we found a dwarf Dandelion, with a white flower and very dark leaves. But the most brilliant Arctic flower is a rich purple Valerian, I believe *Polemonium cæruleum*, of which a few were gathered at Bel Sound.*

* The following species have been kindly named by Mr. Howse from specimens brought home from Spitzbergen, viz., *Ranunculus sulphureus*, *Papaver nudicaule*, L., *Arabis alpina*, L., *Draba alpina*, *L.*, *Cochlearia fenestrata*, Br., *Cardamine pratensis*, L. *Cerastium alpinum*, L., *Stellaria Edwardsii*, Br., ? sp., *Saxifraga oppositifolia*, L., *S. hirculus*, L., *S. cæspitosa*, L., *S. cernua*, L., *S. rivularis*, L., *Dryas octopetala*, L., *Potentilla emarginata*?, *Leontodon taraxacum*, L. var., *Andromeda tetragona*, L., *Polemonium ceruleum*, L., *Pedicularis hirsuta*, *Polygonum viviparum*, L., *Salix herbacea*, *Eriophorum*, ? sp., and traces of a small species of *Equisetum*, etc.

The temperature resembled, generally, a fine winter's day in England, the thermometer ranging down to between 32° and 35° minimum daily. The surface temperature of the sea, which at Tromsö, 69° 38′ north lat., was about 50°, fell as we went north; and was permanent at 32° at our highest point, near the 80th degree. In the Sounds, where unaffected by ice, it was occasionally as high as 38°, but 33° to 35° was the average in Ice Fjord. All trace of the Gulf Stream influence appears to be lost about the north of Spitzbergen.

On our homeward voyage we again encountered the same difficulty in clearing the packed ice round Bear Island, this time aggravated by dense fogs. We first cast anchor at Hammerfest, and thence without further incident reached the Tyne on August 22nd.

P.S.—Since these Notes have been written, one of my former fellow-voyagers, Mr. A. H. Cocks, F.Z.S., has again visited Spitzbergen, but his subsequent observations do not materially add to the information previously obtained. I am inclined to think that the ornithology of Spitzbergen is now tolerably well understood, and that but little more can be expected therefrom than the occurrence of those cosmopolitan stragglers which sooner or later turn up everywhere.

ORNITHOLOGY OF SPITZBERGEN.

General Remarks.—Countless as are the feathered multitudes which make Spitzbergen their summer home, perhaps unsurpassed by any similar extent of country on the globe, yet the element of variety is conspicuously absent. The total number of species recorded from Spitzbergen is only some six-or-seven-and-twenty, while the number observed by us on the cruise of the "Pallas" was but twenty-one or twenty-two.

The whole of its avi-fauna are summer migrants to Spitzbergen with the single exception of the Ptarmigan, which, alone of its class, remains to brave the rigours and the long sunless months

of the Arctic winter, sharing the desolate domain with the Polar Bear, the Reindeer, and Arctic Fox. How it survives the terrible extremities of the winter climate, or what it finds to eat when all is buried in ice and snow, is difficult to imagine. I suppose they will burrow deep into the frozen snow (for which their solid badger-like claws are well adapted), as our Grouse do on a winter's night at home; but what to them is only a few hours' roost must almost amount to months of hybernation to the Spitzbergen Ptarmigan.

In respect of its summer migrants I was somewhat disappointed in Spitzbergen, having gone there in hopes of finding it the breeding place of many of our winter wild-fowl. These hopes were perhaps unwarranted, as I was well posted in the ornithological work that had previously been done in Spitzbergen, and before I sailed Professor Newton also kindly sent me his excellent paper on the subject. (cf. "Ibis," April, 1865.)

There are two reasons which explain this comparative absence of wild-fowl proper. First, the natural features of the country are not at all adapted to the economy of the Anatidæ and Waders. The coasts being rocky and precipitous afford none of those wide tidal oozes which are so attractive to these birds. Secondly, it lies to the north and westward of the general track of migrating wildfowl, which appears to be, in the main, cöincident with the course of the Gulf Stream. This great ocean current, after sweeping round the western coasts of Ireland and Scotland, and the whole seaboard of Norway, is divided, by meeting with a cold Polar current* off the northern extremity of the Scandinavian Peninsula, into two forks or streams. The larger volume of Gulf water proceeds eastwards towards Novaya Zemlya and the coast of Siberia, while the smaller offshoot, continuing its northerly course, impinges on the West Coast of Spitzbergen, and is finally absorbed in the frozen seas beyond.

Almost analogous in result appears to be the northward migration of wildfowl, though not necessarily on the same lines, nor

* The current referred to, issuing from the unknown Archipelago of Franz Josef Land, causes the accumulation of pack-ice in the latitude of Bear Island which I have already mentioned.

are their long migrations performed continuously.* Thus the great bulk of the migrants follow the eastern current to Novaya Zemlya and Siberia, the vast marshy "tundras" of which latter country are so well suited to their requirements. A smaller contingent, principally Brent Geese, follow the lesser, northerly, current to Spitzbergen.

Under these conditions the majority of its avi-fauna are Rock-birds—*e.g.*, Guillemots, Auks, and Petrels—while others are of rock-loving habits. Thus the Turnstone and Purple Sandpiper are never seen here on the sand or ooze, always on rocks; and the haunt of our Eider is some rock-bound bay, where he dives for Dog Crabs. Such are therefore just the species one might expect to meet with there, but the presence of two species of Geese, Red-throat Diver, etc., seems only accountable by their following the warm current above mentioned. The rugged shores of Spitzbergen certainly offer but little attraction to them.

I will now enumerate, with brief notes, the species met with in Spitzbergen in July and August, 1881.

1. *Falco (? sp. Falco gyrfalco).*—A large Falcon was observed by myself and others, soaring high over Bel Sound, on the evening of July 31st.

2. *Plectrophanes nivalis.*—Snow Buntings were abundant, breeding in low cliffs and moraines. They were observed as far north as Magdalena Bay, 79° 35′ N. lat., where broods of young were fledged by 29th July.

3. *Lagopus hemileucurus* (Gould).—With the exception of the four Ptarmigan met with, as before mentioned, on our first landing at Ice Fjord, we came across only one other instance of this species, viz., an old female with her young brood, just able to fly, on August 4th. They do not appear to be numerous, and are, as above described, the only resident species in Spitzbergen. From the Scotch *L. mutus*, and the "Fjeld-rypa" of Norway, the present bird chiefly differs in its superior size. Its wings

* The Brent Geese commence to leave the Northumbrian coast in March, but do not arrive in Spitzbergen till June.

and tail appear proportionately larger, as also are its solid powerful claws. Whether these points are sufficient to entitle the Spitzbergen bird to specific rank appears an open question. Its affinities, however, appear to incline more to the form *L. rupestris* of Iceland and Arctic America than to the European types.

The specimens shot 27th July were in summer dress, but their plumage was exceedingly worn and ragged. In colour, however, it harmonises admirably with the stony ground they frequent. After creeping close up, well within shot of the four above mentioned, I had the greatest difficulty in making them out among the rough stones, though they were accurately "marked." Their call note resembles that of a Grouse cock, but not nearly so loud.

4. *Numenius phœopus*.—We picked up a single specimen, dead, on an island in Van Mijen's Bay, Bel Sound, on 31st July. It was an adult, and from the worn state of its plumage had probably been killed or died in the month of June.

5. *Strepsilas interpres*.—A newly-fledged bird of the year was shot in Ice Fjord, on August 4th.

The two last-named are the first of their respective species which have been recorded as obtained in Spitzbergen. On the other hand, *Œgialitis hiaticula* and *Phalaropus fulicarius*, previously obtained, the latter not uncommonly, were not observed by us.

6. *Tringa maritima*.—Very common in flocks along the rocky shores, and in pairs up the valleys, where they were breeding in marshy spots. A nest found 27th July contained four eggs, much incubated. Two were broken in transit to the steamer, the other two are in my possession. They resemble those of a Snipe, but are smaller. On August 1st I found a newly-hatched brood in a valley off Van Keulen's Bay. Their upper parts were clothed in velvetty black down with a purple sheen, and beautifully spotted with gold.

7. *Somateria mollissima*.—Very abundant in all the Sounds, and numbers were shot, though the old drakes were always difficult to get at. In size they are somewhat smaller, and the

colours rather paler than Northumbrian Eiders, on which grounds the species was differentiated by Prof. Malmgren as *S. Thulensis*. *S. Spectabilis* was conspicuous by its absence, and the only other Duck seen was

8. *Harelda glacialis*, but not abundantly, nor were any specimens obtained.

9. *Bernicla Brenta*.—Spitzbergen is one of the principal breeding resorts of these Geese, and I had the pleasure of meeting with these old friends of many a winter's day on the Northumberland coasts in their Arctic retreats. In Bel Sound and Van Keulen's Bay they were abundant, breeding, with the Eiders, on rocky islands. The old Geese were unable to fly, having entirely moulted their quills. This deficiency was counterbalanced by their extraordinary pedestrian powers. So fast could both old and half-grown young traverse the rough rocky ground that we found it quite impossible to run them down or catch them alive. Their summer plumage appears slightly ruddier than that of winter, owing to their upper coverts being fringed with brown.

Mr. Lamont mentions meeting with the Berniele Goose, *B. leucopsis*, and killing a large number in Advent Bay; but as none of the skilled ornithologists who have visited Spitzbergen have seen anything of it, it appears probable that he was mistaken as regards the species.

10. *Anser brachyrhynchus*, Pink-footed Goose.—We saw Grey Geese in most of the Sounds visited, but being more advanced in the moult, they had recovered the use of their wings, and we did not secure any till our arrival in Magdalena Bay. Here we shot several, which proved to be of the above-named species, and found their young in the downy stage, 28th July, and yellow in colour. Curiously, the latter were less advanced than those of the last-named species, though in the adults the reverse was the case. The Grey Geese breed rather high up on the loose stony detritus or morainal debris which covers the basal portion of the cliffs. In these places we found thickly strewn about their long quill feathers, which appear to be cast all together,

temporarily incapacitating the birds from flight. The young when hatched are taken to the marshy ground below.

LARINÆ.

11. *Sterna macrura*.—Abundant, and breeds on the small islands, where we found many eggs.

12. *Rissa tridactyla*.—Breeds abundantly in the Loomeries.

13. *Larus glaucus*.—First observed off Bear Island, 73° 35′ north lat., the "Burgomaster" was ever in view afterwards, perched on a snow-clad pinnacle, or the peak of a drifting ice floe, his snowy plumage in striking harmony with the frozen scene around.

14. *Pagophila eburnea*.—Tolerably numerous, especially at Magdalena Bay, where a number of stranded "Krengs" of White Whales had drawn together a great number of birds. The "Ice Gulls" were also observed to congregate far inland when a slain Reindeer was being cut up, though none had previously been in sight. The plumage of the Ivory Gull is of a spotless white; its tone, however, more resembles pure snow than ivory. Beautiful as they are in plumage, they are somewhat deficient in elegance of form, and in their habits decidedly nasty.

Having observed one or two pairs of these Gulls breeding on the highest part of Rotge's Hill, Magdalena Bay, and knowing the extreme rarity of their eggs, authenticated examples being almost unknown, I made strenuous efforts to reach the nests. These attempts, however, proved hopelessly futile. The crags were utterly inaccessible to any being not endowed with wings, and in the result I had the utmost difficulty in finding a way down again.

For *Xema Sabinii* and *Rhodostethia Rossi* we maintained a strict look out, but nothing was seen of either of these almost mythical species.

The whole of the Gulls and Terns obtained in Spitzbergen were in full adult plumage, with the exception of a single Glaucus Gull, shot August 4th in Ice Fjord, and which was in the mottled stage.

15. *Stercorarius parasiticus* (L.)—We were disappointed in finding only this member of the *Stercorariidæ* in Spitzbergen itself, though I believe we saw both the Pomatorhine and Buffon's Skuas in the open sea to the south of it, and north of Bear Island. The present species is very numerous, breeding on all the low-lying mossy "haughs" between the cliffs and the sea. The young were hatched when we arrived, and the old birds exhibited great anxiety, and most amusing feints of broken wing and general incapacity, when their nestlings were approached.

The whole of the Skuas seen in Spitzbergen were of the handsome white-breasted variety, with black crowns, yellow cheeks, and a dusky band round the chest. The dark unicolorous form, which is by far the most numerous in Shetland, is wholly unknown in Spitzbergen.

The Skuas were for ever preying upon the industry of the Terns, Kittiwakes, and Guillemots, the latter being frequently compelled to dive (taking a regular "header" from the wing) to elude the pirate, and save his "cheekful" of Shrimps. They even attacked the huge "Burgomasters," and some followed us all the way from Norway, chasing the Kittiwakes which flew in our wake.

16. *Procellaria glacialis*.—This oceanic species joined us the day after leaving Norway, and was our constant companion right up to the Polar ice, just under the 80th degree. With their strange graceful flight, closely skimming the surface of the rolling seas, yet never wetting a feather, the "Hav-hests" struck even the most casual observer as birds of remarkable appearance. Their immense numbers, and their tameness when gathered together to feed on the carcase of a dead Whale or Seal, were surprising. The summer plumage of these Fulmars differed considerably from that usually depicted. The head, neck, and under parts were of a dull smoky grey; while above the ash-blue feathers were much dappled with deeper shades, and with a dirty brown. The whole plumage, in fact, presented a dusky mottled appearance, and on the wing a white band at the base of the primaries was conspicuous. It is a curious circumstance that

this species, which breeds so abundantly in Spitzbergen, and on Bear Island, should entirely pass by the whole Scandinavian Peninsula, and form an isolated colony on our remote isle of St. Kilda. They breed also in the Færoes. Its egg is large and white.

17. *Colymbus septentrionalis*.—A single adult specimen flew close past our boat on the night of 27th July, in Ice Fjord; but I was too tired to trouble with him, having just returned from a stalking expedition of twenty-two hours continuous hard walking, and carrying the meat of a fat Reindeer Buck great part of the time.

ALCIDÆ.

I now come to the Rock fowl, whose astounding numbers I have already attempted to describe. They are of four species, as follows:—

18. *Uria Bruennichi*.—This is perhaps the most numerous species in Spitzbergen, though the immense numbers of *Mergulus alle* run it a close race for that position. These large Guillemots have huge Loomeries in most of the high cliffs, and thousands are always in sight, swimming and diving in the Sounds, or studding the drift-ice with quaint upright forms. The Norwegians salted down hundreds of them in barrels for home use, and we had "Loom Soup" daily, which I remember we considered passable, at least in the Arctic seas. We saw the first young birds in the water on August 2nd.

19. *Uria Mandti*.—This pretty little bird was nearly always in sight, sitting tamely close to the ship, resting on floating pieces of ice, or diving in the open spaces between them. It was not nearly so numerous as the former species. Though specifically discriminated from *U. grylle* by scientific writers, it differs in no essential particular from the "Tystie" of Shetland.

20. *Fratercula glacialis*.—The large Arctic Puffin was comparatively scarce. Still a few could generally be detected among the swarming hordes of other sea fowl, the bright red colour on the bill being very conspicuous.

21. *Mergulus alle.*—These impudent-looking little birds became very numerous as we approached Spitzbergen. While steaming along the coast we appeared at times to be literally cutting a lane through the floating hosts of these birds and Guillemots. In all directions round our bows the sea was furrowed by them in their efforts to rise and get out of our way, efforts which usually proved futile, as, probably owing to their quills being drenched with incessant diving, they seemed unable to rise from the surface; and finally, after splashing along perhaps fifteen or twenty yards, they would give up the attempt and go down headfirst. They were equally numerous in all the Sounds; and in the Loomeries their little white breasts studded every ledge and projection of the crags, up to elevations of perhaps two thousand feet. We observed these birds, together with Guillemots, Arctic Puffins, Fulmars, and Kittiwakes, right up to the edge of the Polar Pack, by which our advance was finally stopped, just under the 80th degree north latitude.

The Little Auk swims rather deep, and very much "by the stern." Their cries are singularly weird—an incessant chattering carried on in varying keys, and finally modulating into a prolonged wild "twirl," the latter a characteristic component in the volume of voices which resound from the Arctic cliffs.

EXPLANATION OF PLATES.

A Waif of the Arctic Seas.....Frontispiece.

North of Horn Sound; Finners.....Plate III.

Head of Van Keulen's Bay; White Whales.....Plate IV.

Head Glaciers, Green Haven; Seals.....Plate V.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ BY THE PRESIDENT, E. I. J. BROWELL, ESQ., AT THE THIRTY-SIXTH ANNIVERSARY MEETING, HELD IN THE MUSEUM OF THE NATURAL HISTORY SOCIETY, NEWCASTLE-UPON-TYNE, ON FRIDAY, MAY 11TH, 1882.

LADIES AND GENTLEMEN,—The time has now arrived when it becomes my duty to vacate the position of President of your Society. When your Committee last year paid me the compliment of proposing that I should be nominated for the office, I represented to them, as strongly as I was able to do, that it is very desirable that this position should be held by some one more entitled to be considered a Naturalist, and whose name and reputation in that respect should rather add to the prestige of the Club, and I was in hopes, even to the last moment, that a gentleman pre-eminently entitled to the honour would have been induced to undertake its duties; he, however, pleaded the pressure of Natural History labours impending and in hand, labours of which the lovers of Natural History in this neighbourhood will, through the Natural History Society, reap the benefits. I also represented that I was likely to be so much from home during the summer and autumn that my attendance at the Field Meetings could not be what it ought; however the members at their meeting at this time last year thought fit to elect me for the second time, I having had the honour of holding the same office thirteen years ago. Owing to my having been unable to attend many of the meetings, I am mainly indebted to the notes of what took place, supplied to me by my friend Mr. Howse.

The FIRST FIELD MEETING of the year was held at Corbridge, on Whit Monday. Though the state of the weather in Newcastle was most unpromising, a large party of members and friends left the Central Station by the 10.20 train. Passing through heavy showers for the most part of the short journey the members were delighted to meet with fine weather on their arrival at their

destination. After a short consultation in the village the bulk of the party visited some limestone quarries on their way to Aydon Castle. Large crushed specimens of *Productus giganteus* and numerous fragments of a *Fenestella* were the most conspicuous fossils found. The usual spring flowers were in full bloom and great luxuriance in the sheltered and wooded burns. Aydon Castle stands on the north side of a deep ravine, near the edge of a tremendous precipice; this situation being chosen probably for defence, as the whole building bears the character of a Border Keep, and is fortified on the land side by a double wall of defence of great thickness, the outer wall no doubt being intended for the protection of cattle. The Wallflower, Greater Celandine, and Wall Pellitory were growing abundantly on many parts of the castle. After a short visit by some of the members to see some curious remains in the interior, the party wended their way, under the shelter of well-grown trees, chiefly Ash, to Halton Chesters, which is an old Peel Tower converted into a modern residence, the situation commanding a fine view to the south and along the course of the Tyne far to the west. A heavy hail-storm had passed along the ridge in the early morning, covering the ground an inch or more in depth, but though thundering heavily down the Tyne, the party experienced only a passing shower, and in the afternoon the sun shone out in full power.

Most of the party, after visiting the small Roman Station of Halton Chesters, followed the line of the Military Road to Stagshawbank; others crossed by footpath to have a look at the Kennels of the Tynedale Hunt, and were as much interested and delighted by the sight of so many fine hounds, through the courtesy of Mr. Cornish, as if they had been sportsmen as well as naturalists. The ferns and flowers cultivated here were also of much interest. Descending the steep bank from Stagshaw a beautiful view was obtained of the surrounding country, covered with well-grown trees, now in early spring leaf. The avenue of Limes at Stagshaw House, lit up by the evening sun, was seen to perfection. About forty members sat down to dinner at the Angel Inn, after which five gentlemen were elected members. As the evening was very fine many of the party strolled about

this favourite resort till a late hour, enjoying the flight of Swifts and Swallows and the rustic peculiarities of this quaint village till the time arrived for the last train home, and on reaching Newcastle finding that very different weather had prevailed there all day. The botanical results of the day were not extensive, as the road lay chiefly along well beaten tracks.

The Second Field Meeting was held June 29th and 30th, at Middleton-in-Teesdale for headquarters. Many of the members arrived there on Tuesday, and had a pleasant stroll in the evening up the Hudeshope Burn, gathering on the way several Orchids in fine flower, and the Moonwort and two or three other ferns. This burn is of great length, and forms in many parts a deep fissure in the side of the main valley, and in rainy seasons pours large quantities of water into the Tees.

The excursion on the first day was fixed for Lunedale and Mickle Fell, and the party on the arrival of the early train was twenty-eight stong, including several ladies, properly equipped for moorland travelling and the bad weather likely to be met with in upper Teesdale. Lunedale is a long, wild, cold-looking, straggling valley of ten miles stretch. Our route by the road was on the north side, which is steepest, high up the hillside; the south side is flatter and not so lofty; the Lune lies concealed below. This, no doubt, and the murky threatening weather, prevented us from full appreciation of Scott's description—

"Silver Lune from Stainmore wild."

For the most part the views from the road were bleak and bare, especially in the higher part of the valley, after passing Saddlebow and Wemmer Gill. Saddlebow takes its name from the peculiar configuration of the hill, formed by two beds of basalt, tilted up at a high angle, and separated by a soft shale, which has been deeply denuded between them. At Wemmer Gill we met with *Asplenium viride* and *Cystopteris fragilis* growing on a wall by the roadside. A few distant farm houses, and cottages by the wayside, and the dim outline of far distant hills, not lit up by sunlight but shaded by thickening mists and showers, completed

the not very cheering prospect as we drove along towards Grains o' the Beck Inn.

> "But, westward, Stainmore's shapeless swell,
> And Lunedale wild, and Kelton Fell,
> And rock-begirdled Gilmanscar,
> And Arkengarth, lay dark afar."

At this place we left our conveyances, and having secured, on account of the uncertain weather, the best guide we could obtain, we started off up the Long Grain for half a mile, gathering on our way plenty of *Primula farinosa* and *Polygonum viviparum* in full bloom, with the Globe Ranunculus and other sub-alpine flowers. Our road led over the Long Grain Moss to Close House Miners' Hut, now abandoned, sheltering ourselves now and then from pelting and drifting showers sent down from Mickle Fell with great impetuosity. On the moss we gathered a few flowers of the Cranberry, by excessive drainage now becoming rare on our Moors and Mosses, and our first specimens of *Saxifraga stellaris* in fine flower. Our route now was over a couple of miles of inveterate "Moss Brocks," amid thick driving mists from the mountain top. At length we managed to reach the green grass-covered plateau of Mickle Fell, but so thick and threatening were the drifts or clouds of mist that our guide hesitated to go farther, and after realizing, that we were really on the grassy top of this highest Yorkshire hill, that it was a large lonely isolated mass of the Great Limestone, and having gathered a few Violets and some stunted specimens of *Saxifraga hypnoides*, we set off down hill in the direction of West Hush and the Arngill Beck, which was soon reached. At the West Hush *Lycopodium selago*, *alpinum*, etc., and some ferns, one very much like the Holly Fern, were obtained. Passing the pool of water called the Fish Ponds, we were soon at Grains o' the Beck Inn. Some cups of refreshing tea prepared us for the homeward ride to Middleton, where a welcome meal awaited our arrival.

In passing over the moorland we came upon the eyrie of a Merlin, containing three young in the early downy stage. Our attention was first drawn by the parent bird flying off as we approached, and while we examined the young birds she flew in

circles round us wildly screaming, returning immediately to the nest after we had left the spot.

The next morning, though the night had been very wet, and the weather showery, we all started immediately after breakfast for Langdon Beck. Heavy showers fell occasionally, but did not prevent some members of our party from the determination which they had made to see Caldron Snout by way of Falcon Clints, a difficult road in wet weather. Others lagged behind gathering strange flowers in pastures new. *Sedum villosum* and *Primula farinosa* were seen in great perfection, and further on *Tofieldia palustris* and *Bartsia alpina* in full flower. A young Plover and three nests of the Meadow Pipit with eggs now attracted attention, and also the wonderfully wild crags and scenery of this unique locality, so far as the county of Durham is concerned, where Cronkley Scar,

> "Prominent above the rest
> Rear'd to the sun its pale grey breast,
> Under its broken summit grew
> The Rowan Ash and sable Yew;
> A thousand varied lichens dyed
> Its waste and weather-beaten side,
> And round its rugged basis lay,
> By time and thunder rent away,
> Fragments that from its frontlet torn
> Were mantled now by birk and thorn."

Following the course of a small burn, the special plant of the district, now out of flower, was observed; also specimens of *Tofieldia palustris*, *Saxifraga azoides*, and the Buckbean. On some of the adjoining pastures the flowers of *Conopsea albida* and *Helianthemum* were gathered, and by the side of Harwood Beck, almost its highest station in the valley, the *Potentilla fruticosa* was observed, but not yet in flower. Crossing as best we could the foot of Harwood Beck we came upon a fine mass of basaltic rock, underlying a thick bed of drift, very distinctly glaciated. This seems to form a part of the same bed which we observed strongly glaciated at different places on our way up to the turnpike road, on both sides of which the glaciation is very strong

and apparent. From this point conveyances took the majority of the party to Middleton, and after dinner most of them left for Newcastle, having enjoyed, notwithstanding the very unfavourable weather, a pleasant visit to Teesdale. Eleven ladies and gentlemen were proposed and elected members of the Club.

Third Field Meeting.—About eight members left the Central Station for Bellingham by the 6.20 train, and after breakfasting together they proceeded to explore the heaps of the old iron works for fossils and to botanize over the neighbourhood till the arrival of the President and main body of the party. They then, after short delay, proceeded up the Hareshaw Burn, the road being now made passable through the dense underwood by the thoughtful kindness of the late Mr. Charlton of Hesleyside. Numbers of interesting plants were observed, among them being fine specimens of *Neottia nidus-avis*, the Butterfly, and other Orchids, the Enchanter's Nightshade and Pencil Vetch, Beech-Oak and many other Ferns growing in tropical richness and profusion, and protected, it is to be hoped, from the ruthless destruction of wanton excursionists. After viewing the romantic and precipitous sandstone rocks in the neighbourhood of the Lynn a start was made for Callerhues Crag, where, at a height of nearly twelve hundred feet, very extensive views can be obtained of the surrounding and distant landscape. From this point a descent was made to the inn at Bellingham, over moor and peat bogs and grassy hillocks, the fine weather and fresh mountain air rendering the walk most exhilarating. Two land shells, unusual in such high situations, *Helix lamellosa* and *Azeca tridens*, were collected by one of the party, and the little Frog Orchis (*H. viridis*, Br.) and another, perhaps *Orchis maculata* var., was abundant among the heather. The Crossleaved and Black Heath and the Common Ling were in some spots in full flower. More than twenty members dined together, and afterwards visited the Church, under the guidance of the Rev. B. B. Powell, who pointed out the peculiar features of its architecture, the most remarkable being its fire-proof stone roof, an interesting memorial of the wild times when churches were liable to be burned down

by the marauding crowds of invaders to whose visits these border districts were peculiarly liable. Though nothing very rare was observed in this now often-visited locality, yet the fineness of the weather, an unusual feature during the year, made this day's outing most enjoyable. Leaving Bellingham at eight o'clock, the party soon were scattered at the different stations on the route to Newcastle.

The weather for some time previous to the date fixed for the Fourth Field Meeting had been most unpropitious, and as a consequence only three members left Newcastle by the early train, and two of these had travelled by a still earlier train from Sunderland. On the way two more friends joined, but our muster at the inn at Greenhead was so small, compared with more favourable visits, that we had some difficulty in our endeavour to make the landlady believe that we represented the Tyneside Club; but at length breakfast was brought in, which we enjoyed, notwithstanding the heavy downpour of rain which came on after our arrival at Greenhead. We visited the neat little country church, restored by the thoughtful benevolence of the late Edward Joicey, Esq., of Blenkinsopp Hall. The weather ameliorating a start was made up hill for the crags, the camp at Cærvoran being left for finer weather. On our way up the slope we observed a fine uncovered piece of the basalt smoothly glaciated and covered with very fine striæ. Reaching the wall at the edge of the cliff, we followed it step by step up and down over the Nine Nicks, sheltering ourselves occasionally among the crags and wild flowers as the showers drifted past. The face of the Wall Town Crag was searched most diligently for the Parsley Fern, but only two specimens were seen where formerly this local fern was very abundant. Though the roots of this plant are carried away by hundreds and thousands they all die down after a few months' attempt at cultivation, and even if the cultivation is successful for a few years, still the plants gradually grow weaker and less able to bear the close atmosphere of fernery, rockery, or greenhouse. All the plants in short removed from their native haunts die a longer or shorter lingering death.

It is to be hoped that our members when they visit the habitat of this pure-air-loving plant will content themselves with one specimen only, and remember the greater pleasure they felt in visiting its native place, and seeing it growing in perfection, than in watching it dwindle and die in their own hot-air room or conservatory. We missed the locality for the Chives, said to have been introduced by the Romans, but as this plant is found on many basaltic rocks far distant from Roman Stations it is probably indigenous. The Golden Rod and the Hawkweeds were in splendid flower, but the rain prevented us examining them closely, and cooled all botanical ardour. After finishing with Wall Town Crags, and in diminished number, some of our friends having returned to Greenhead, we abandoned the idea of going three miles as the crow flies to Gilsland, over a rough piece of moorland in wet weather, for a dinner; and keeping the line of the wall we followed it undeviatingly to near Æsica. The pelting showers compelled us often to take shelter on the north side of the wall, which was in some places six feet high, and afforded ample protection, and here

> "We pored by the hour
> O'er the ferns and the flowers,
> And the slugs that came crawling out
> After the showers."

In reality, very fine and large Slugs, which we did not capture, and numerous specimens of *Clausilia dubia*, of which we brought away a few, were very abundant, coming out of the joints of the old Roman Wall on the north side; and *Cystopteris fragilis* was in great profusion all around. The weather becoming hopelessly worse, a rush was made down hill towards Haltwhistle, where, at the Sun Temperance Hotel, we dried our raiment, obtained a good and cheering cup of tea, took an early train, and reached Newcastle at seven o'clock, after twelve hours of great enjoyment.

Twenty-five members attended the Fifth Field Meeting, held at Hesleden Dene and the Black Hall Rocks. The day was remarkably fine, and this picturesque and rock-bound part of the

Durham coast was much enjoyed. Only a few plants were in flower at this late season, but *Geranium sanguineum* and the Grass of Parnassus were still in fine flower. *Asplenium marinum* appears to have been completely eradicated, either by man or the severe winters which have for some years prevailed, and which would certainly injure any exposed plants of this southern species. The higher parts of Hesleden Dene are now much destroyed, and the burn is a channel for the waste water of the adjacent colliery. Notwithstanding the difficulties of the route, most of the members, ladies and gentlemen, followed the bed of the burn, the lofty cliffs of which rival in height those of Castle Eden, and had the same care been taken with this it would have been much superior in romantic beauty, being often narrower and deeper, and as noted for rare plants as its more carefully preserved neighbour. Some of the party followed the Dene to the seashore, and had the satisfaction of seeing the Hart's Tongue still existing on some of the more inaccessible cliffs. Others explored the picturesque and extensive caves at the Black Halls along the shore. The cliffs themselves were much disguised by a thick coating of mud brought down by the melting snows of the previous winters. After a substantial tea at Deneholm the party strolled by way of Hardwick Dene to the railway station.

At the Concluding Field Meeting, at Marsden, only ten members and friends were present. Though stormy no great deal of rain fell during the day. The route was by Cleadon Lane and Boldon Flats, to view the large drains that had recently been cut to carry off the water from this as yet unreclaimed piece of land, and it is to be feared, looking at it from a naturalist's point of view, the attempt has been only too successful, for if the deep ditches can be kept open, even for a short time, all the water plants will be effectually destroyed, and the water birds which have been accustomed to frequent and even to breed here will be driven from their accustomed haunts. Last year, 1880, several pairs of Snipe and as many Wild Ducks had nests here. With very little trouble and expense this place might have been converted into a southern Palinsburn, and would have afforded

intense pleasure to thousands of persons, and valuable instruction to others, by enabling them to observe the habits of birds, which would have been attracted and drawn to this neighbourhood instead of being as now banished from it. It is very questionable even now that such low-lying land, not much above the sea level, will ever be effectually and profitably drained; in the meantime the plants and birds are destroyed or banished for many generations.

Arriving through the fields at Cleadon House the members were courteously entertained and shewn through the grounds so frequently visited during the lifetime of our former President, by his nephew Mr. H. C. Abbs. The water-works of the Sunderland Company were, through the kind arrangement of Mr. Vint, thrown open for the inspection of members who, not having seen this district before, were gratified by this sight only a few miles from home. They then followed the old bridle-road through Fardingslake to Marsden, and sat down, few in number, to a comfortable tea in Marsden Grotto, the scene of many a large and happy gathering of the Club, but this locality, like many others in our neighbourhood, now seems doomed to destruction by the stern necessities of our advanced civilization. It is greatly to be regretted that a coast of such unique interest to geologists, and to others in search of the picturesque and romantic, should pass away without some attempt being made to record its former beauty in the pages of our Club's Transactions. After tea the members hastened through the pelting storm to the nearest railway station, but though the weather had not been most favourable all felt the better for this hurried visit to Marsden.

One Evening Meeting only has been held this winter jointly of the Field Club and Natural History Society, viz., on the 14th March. It was well attended, and the following papers were read:—

Notice of Salmon Trout in the Ouseburn during the Spawning Season, by R. Y. Green.

Notice of a New Lichen, *Lecanora albo-lutescens* (Nyl.), found in Northumberland, by the Rev. W. Johnson.

A Short Account of the Club's Visit to the Bass Rock, July, 1880.

Mr. Howse's narrative of the visit to the Bass, and his remarks on the various objects of interest relating to the excursion, was fortunately not very short, and was heard with much interest, recording what was seen and discoursing pleasantly of that very interesting locality and its inhabitants. Mr. Green's observations on fish in the Ouseburn shews what an amount of filth a fish can put up with for a time! On the subject of Mr. Johnson's communication I have not much knowledge, but have many and many a time admired the beautiful and harmonious colours given to old walls and crags and rocks by the infinite variety of the tints of the various Lichens, especially when our travels lead us to where the atmosphere is unadulterated and moisture abounds.

Referring to the remark I have just made about the geological and picturesque features of our coast between the mouth of the Tyne and Whitburn, would it not still be possible to obtain some such record by means of photography or otherwise, accompanied by geological diagrams and descriptive letterpress? Would it not facilitate its accomplishment if a Special Committee were appointed to get it carried out? and, if necessary, special subscriptions might be asked for, as was done in the case of the photographs of "Remarkable Trees." If anything is to be done there is no time to be lost. Many interesting features have already gone, and others are disappearing daily.

Such is the record of our out-door meetings during a summer which succeeded a winter, the last of a series of extreme severity. Most of us have had occasion to note some of the effects of this severity; for instance, the great extent to which the Common Whin has been destroyed, the injury in many places to Shrubs, and, as we saw at Bellingham, the destruction of the Lombardy Poplars, some of which, from their size, had evidently stood a good many years. The mortality amongst birds must have been great, from the accounts we heard of the numbers found dead about the coast and elsewhere. Great numbers of Partridges were found in the hedges dead and in an emaciated condition. In my own garden we had during the snowstorms quite a large assemblage of birds, which came to the food we supplied for them

every day. We placed in large dishes most of the scraps of the house, consisting of a variety of food, animal and vegetable. Our visitors included Thrushes, Blackbirds, Starlings, I think three species of Titmice, various Finches, and other familiar birds; and the Rooks also came for their share, though the food was placed not many feet distant from the windows, where we went frequently to look at them. In Argyleshire, where there are birds in considerable variety, a great number of Herons and Curlews succumbed to the cold, at least my keeper found many lying dead about the shore, and they were much less abundant last autumn than usual. I hope we are now entering on a cycle of milder seasons. Certainly the contrast between the winter just over and the preceding one has been extraordinary in point of temperature. Mr. Lyell, of the Literary and Philosophical Society, informs me that according to the observations recorded by him, the thermometer never went down so low as 25° Fah. last winter, whereas in the preceding it did so on nineteen days! This applies to the months of November, December, January, February, and March. The lowest temperature he recorded last winter being 29° F., whilst the winter before it was 4° F.! But if there were no low temperatures to encounter there were furious storms of wind, notably that in October, when so many thousands of trees were blown down, the scene in some places where it had been most severe reminding one, on a small scale, of the descriptions given of the effects of a tornado in the American forests. It was at this time too that there was such a lamentable loss of life and property amongst the fishermen of the Berwickshire coast.

I don't know how far it may be owing to the mildness of the last winter, or to the winds prevailing in October, but the number of Woodcocks in the western Highlands of Scotland has been much smaller than usual, in fact I am inclined to think we had no Scandinavian immigrants, the number I saw in December being I think no more than what remained of those bred on the ground; and I heard that the same scarcity prevailed generally in the district. I thought that they might have missed that particular district, but that on their return in the spring from

Ireland or places to the north more might have been observed, as we often find a considerable number do come at that time, but my keeper tells me he does not think any more have made their appearance.

During the past winter the weather was so mild, and so seldom even were the nights very cold, that many flowers kept their blooms during the winter, and we had from time to time some spring flowers prematurely appearing as if they were bewildered, some Butterflies emerged also extraordinarily soon from where they had been hybernating; but as if to remind us that our climate is not to be trusted, we have had some very cold weather during the last six or eight weeks, the thermometer once or twice having gone down so low as 25°, and on several days during April never got much beyond 40° during the day; this I fear would injure the fruit blossoms, which were very forward; it certainly blackened the tops of the early Potatoes in my garden.

One often hears it said in an offhand way that our climate is much changed for the worse, I mean especially in the N.E. part of England. Is this so? There are things which seem at first sight at any rate to indicate it. For instance, I can remember when in the village of East Boldon House-Martins and Swallows were very abundant, the nests of the former being built in the corners of most of the upstairs windows facing the south, and there were dozens of them under the eaves of the cottages. It was interesting to see them continually on the wing from early morning till late in the evening. Now for many years there has scarcely been a pair seen there. An occasional pair of Swallows still visits us. Is this occasioned by the scarcity of some favourite article of food? I understand that certain insects which were formerly abundant in localities known to entomologists are now rare. On the other hand I can testify that some insects not loved by gardeners are still only too plentiful. Here is another memory of a happier state of things. Within my recollection abundance of fine Peaches, Nectarines, and Apricots used to ripen on the walls of my garden facing the south, now for a good many years we have only been able to get a precarious few, small and imperfectly ripened. We find also that trees

generally don't flourish as they did. Many Sycamores, the tree that has always seemed to succeed best with us, have died, and others are dying. As we go nearer to the Tyne we find this dismal state of things intensified. About Hebburn Hall and the village of Monkton, where, within fifteen or twenty years, were some flourishing well-foliaged trees, there are little else than bare and blasted stems. The Hawthorn hedges are gradually dying, and within a mile or two of the Tyne, between Gateshead and South Shields, there are scarcely any surviving! The agricultural crops are scarcely in better plight. In these cases there is little difficulty or doubt in pointing out the cause. The fumes from the chemical works fully account for it, and I suppose the enormous quantities of black smoke given off into the atmosphere from other sources help the effect. Doubtless also they are partly the cause of the deterioration in our gardens. Is it also chargeable against them that they have driven away the Martins and the Swallows? Is it fair that this damage is to be inflicted on the entire property of a neighbourhood? Few will contend for this, and as it is certain that most if not all the offending vapours can be condensed or prevented, surely the law ought to compel it to be done.

To pass for a moment from subjects more particularly belonging to our own neighbourhood there has occurred during last month an event which every student of Natural History, every one interested in the solution of the problems presented by the phenomena of Nature, must feel to be a great loss, I mean, of course, the death of Charles Darwin. In a short article written on the occasion by a distinguished man of science I find, coupled with remarks which many think uncalled for, those sentences, which, so far as I have the means of judging, accurately describe him, "and this loss, thus his death will be felt to be by many, not merely because of his wonderfully genial, simple, and generous nature; his cheerful and animated conversation, and the infinite variety and accuracy of his information; but because the more one knew of him, the more he seemed the incorporated ideal of a man of science. Acute as were his reasoning powers, vast as was his knowledge, marvellous as was his tenacious

industry, under physical difficulties which would have lowered nine men out of ten into aimless invalids; it was not these qualities, great as they were, which impressed those who were admitted to his intimacy with involuntary veneration, but a certain intense and almost passionate honesty by which all his thoughts and actions were irradiated, as by a central fire." Few of the names of the students of Nature have been so familiar, for the last twenty years at any rate, as that of Darwin. Undoubtedly the publication of his "Origin of Species" made an epoch in the study of Natural History. Sir John Lubbock in his opening address as President of the British Association last autumn stated, as the axioms on which Darwin's theory was founded, "1st, That no two animals or plants in Nature are identical in all respects. 2. That the offspring tend to inherit the peculiarities of their parents. 3. That of those which come into existence only a small number reach maturity. 4. That those which are on the whole best adapted to the circumstances in which they are placed are most likely to leave descendants. That this work, the "Origin of Species," gave rise to much controversy, that the views it propounded were eagerly adopted by some, and as strenuously opposed by others, was what was to be expected. But many even of those who opposed his views will agree with Sir John Lubbock when he says, "No one at any rate will question the immense impulse which Darwin has given to the study of Natural History, the number of new views he has opened up, and the additional interest which he has aroused in and contributed to Biology." One cannot too much deplore the tone which some of his admirers and disciples have employed, and as it appears to me the unphilosophical language they have used, in their eagerness to attack systems which they think stand in their way. It is in such points as these that we find how superior Darwin was in his earnest search after 'Truth' to those who claim to be his followers; and then what a power of description he possessed! How delightfully he pictured either natural objects or the phases of Nature. I well remember with what delight when a boy I first read his "Voyage of the Beagle." How one went on charmed from chapter to chapter, and how beautiful are the

passages in the last chapter of the work about the scenery of the Tropics, the desolate forests of Tierra del Fuego, the aspects of the "illimitable ocean;" and what a healthy patriotic tone he manifests where he enthusiastically speaks of the effects in the Southern Hemisphere of the introduction of Christianity and the spread of British influence! The Treatise which he wrote soon after his return from this voyage, embodying his theory of the formation of Coral lagoon islands or "atolls" was, if I mistake not, one of the works which first, or in a great measure, established his reputation. His was indeed an industrious life even to the very close, for quite recently he has published works abounding in evidences of close observation and thoroughness in working out the subject he had engaged in. It has often struck me, and I suppose of course many others, how much he has in common with Humboldt. Without comparing the extent, or variety, or profundity, or completeness of his knowledge with that of the great German, there is the same love and appreciation of Nature, the same earnestness in searching into her mysteries, and to a great extent the same power of enlisting the interest of his readers.

I have heard it said that there are not so many papers now in our Transactions as there used to be. If this be true what is the reason? Not, I hope, that there are fewer workers amongst the members. It can hardly be that there are not subjects still awaiting treatment. It is true that we have had for some time a valuable collection of Catalogues, but there yet remains work of this kind to be done, and there are many subjects to be treated either generally or locally. In illustration of this I would point to the interesting volume published during the past year by Mr. C. M. Adamson, in which he gives some of the results of his careful observations on birds, extending over many years, and I would mention as especially interesting the account he gave in a previous volume of Prestwick Car, a happy hunting ground, which has now alas been destroyed for a good many years. Next to having the Car itself it is well to have this trustworthy account of some of its aspects and points of interest. There are to be found in these works two chapters bearing on some of the

questions about birds which still remain very imperfectly understood. The great subject, for instance, of their migrations.

Another book about birds, "Siberia in Europe," by Mr. Seebohm, a gentleman personally known to some of us, has been largely read, and is exceedingly interesting. His special object in his long and toilsome journey was to find the breeding places of certain birds. In this he was very successful; but what I wish to refer to at present is a portion of his book where he discourses of the migration of birds. He seems to have a strong disinclination to resort to instinct as the explanation of the phenomena, but comes to the conclusion that the desire to migrate is an "hereditary impulse," which I should think is not very different. But he thinks that the idea that the bird knows by instinct where to go has no foundation in fact. He thinks each bird must find out for itself, and as best it may, proper winter quarters, and, I suppose, summer quarters also. But he says in one page that at migration time birds congregate to have the experience of the veteran travellers, and on the next page he says, "astounding as the fact is, it is nevertheless true, that the birds of the year are the first to migrate, birds which of course have not migrated before." This latter observation is in accordance with the report of the Committee on this subject at the British Association last year at York. Again, Mr. Seebohm seems to argue that it is by their wonderful sight and memory of localities that birds manage their migration; but this explanation won't meet the case of the birds of the year who have never travelled nor had experience of the road before. But wonderful as is the sight of a bird how far would this assist them in a journey of thousands of miles?

A very popular amusement at present is the training and flying of Homing Pigeons, and their return to their home is accomplished through their great powers of sight and recollection of localities; but this power is only calculated on for comparatively reasonable distances. For instance, a bird which it is intended shall be taught to find its way home to Newcastle from let us say Peterboro', is not taken and flown at once from there, but is first flown from a few miles distant, and is taught by being

flown at constantly lengthening distances until it is competent, by the knowledge or experience so gained, to find its way home from the point at first determined on. Now, Homing Pigeons are probably at least as highly endowed with the necessary qualities of sight and memory of locality as the ordinary migrating birds. This rather seems to indicate that instinct is in some way the agent in these wonderful phenomena of bird life. Then as to the causes of migration. Mr. Seebohm says it is "*want of food not want of warmth*," but on the next page he narrates what he observed in Greece, which goes directly to negative this! There, in certain localities, insect life appeared to be superabundant, and some species of insect-eating birds remain and feed there all the year round; others stay during certain months, and on their leaving others come. How is this to be explained? Again, amongst the immigrants which come to this country in the autumn are many of species well known to us, and which live with us all the year round. What is the reason why some individuals stay here altogether, and some only come from foreign countries for a few months and return thither? Or do any of our home-breeders or their descendants join the foreigners when they leave us? In Argyleshire, where I live during part of the year, a considerable number of Woodcocks breed. We see them during the breeding season, and their nests are found and the young ones seen from time to time, but during the autumn we see very few indeed; and after a good many years' observation, and after having often talked it over with Mr. Hancock during his visits to us there, I am satisfied that these young birds don't all remain in the immediate neighbourhood where they are bred, but that some of them undertake a migration to Ireland or elsewhere; but what can be the reason for this I don't know. In making these remarks on this subject I have mainly had it in mind to show how much in even this one branch of Natural History there is yet to be done. A Committee was appointed at the Swansea meeting of the British Association to obtain observations on this subject at lighthouses and lightships, and they presented a very interesting report at the York meeting last September; it included reports from one hundred and three

stations on our own coasts, and they have reports also from Heligoland, a station well known to ornithologists for the wonderful migration phenomena to be seen there. Already some very interesting facts have been established; and with the further evidence which will doubtless be collected by this means, and by the researches of such enterprising and accomplished ornithologists as Mr. Seebohm, we may hope to have by-and-bye a good deal of light thrown on this interesting and mysterious subject.

In conclusion, I cannot forbear congratulating all the lovers of Natural History, of this neighbourhood especially, on the rapid progress, and the prospect of the early completion of the New Museum of the Natural History Society of Northumberland and Durham. The accomplishment of this undertaking would have been exceedingly difficult but for the munificent contributions which have been given by a few liberal and wealthy friends of the Society. When completed the Society will be in possession of a building admirably adapted to accommodate and display their valuable collections, which now cannot be properly made available for want of space. It is only proper to say that for the conception and carrying out of this undertaking the Society and naturalists generally are indebted to Mr. John Hancock, but I may almost say more important than this is the noble gift to the Society of his own ornithological collection. Those of us who have already had the privilege of becoming partially acquainted with it are able to appreciate the gift, while those to whom it is yet unknown will before long have the opportunity of studying it in the new building, where it will be arranged under Mr. Hancock's superintendence. Much might appropriately be said on this subject now, but a future occasion will perhaps be more appropriate. It may perhaps be the pleasant lot of my immediate successor to congratulate you on the opening of the new Museum.

The following ladies and gentlemen were elected members of the Tyneside Naturalists' Field Club during the years 1881–2 :—

At the Anniversary Meeting, May 27th, 1881 :—Mr. J. Grabham, G. H. Glendinning, Wm. Gilhespy, Wm. Nichol, Thomas West, Newcastle; John L. Turnbull, Gosforth; James Taylor Smith, M.D., Bellingham; Thomas Wilson, M.D., Wallsend; John Rogerson, Croxdale Hall; F. C. T. Challoner, Benwell Lodge.

At the First Field Meeting, Corbridge, June 6th :—Mr. William Batchelor, 9, Eslington Terrace; And. N. Cohen, West Jesmond, Newcastle; Miss Lowrey, Broomhaugh, Riding Mill; Charles D. Young, Corbridge; Thomas Jones, Durham.

At Middleton-in-Teesdale, June 20th :—J. G. Goodhall, 21, Collingwood Street; Septimus Dunn, Quayside; Richd. Ormond, Thomas Prosser, Harrison Place, Newcastle; J. Wilson Hunter, 24, Bewick Street; William Hymers, Regent Terrace, Gateshead; Miss M. M. Fayle, Chirton Cottage; Henry Gibson, 28, Northumberland Street; Wm. Horsley, Chirton House; Leighton Mills, South Preston, North Shields; R. F. Spence, West Cramlington.

At Evening Meeting, March 14th, 1882 :—William Mathwin Angus, Saltwell Hall, Gateshead; George Harkus, Newcastle.

THE TREASURER IN ACCOUNT WITH THE TYNESIDE NATURALISTS' FIELD CLUB.

FROM JANUARY 1ST TO DECEMBER 31ST, 1881.

Dr.

1881.		£	s.	d.
Jan.	To Balance brought forward	68	16	1
	,, Subscriptions	119	7	6
	,, Sale of Transactions	11	11	2
		£199	14	9

Cr.

1881.		£	s.	d.
Dec.	By Honorarium to Secretary for editing Transactions.....	60	0	0
	,, Commission on Subscriptions ..	7	1	9
	,, Postage	0	9	2
	,, Expenses of Meetings	9	3	6
	,, Journal, printing Notices, etc...	27	19	1
	,, Balance	95	1	3
		£199	14	9

Signed,

J. S. FORSTER.
T. P. BARKAS.

The following gentlemen were elected officers of the Club for the year 1882–83:—

President.

Rev. R. F. Wheeler, Whitley.

Vice-Presidents.

John Hancock, Esq.
John F. Spence, Esq.
D. O. Drewett, Esq.
John Philipson, Esq.

Ralph Carr Ellison, Esq.
Rev. J. F. Bigge, M.A.
D. Embleton, Esq., M.D.
Rev. Canon Tristram, F.R.S.
George Wailes, Esq.
Rev. A. M. Norman, M.A.
Rev. J. C. Bruce, LL.D.
Rev. A. Bethune, M.A.
E. J. J. Browell, Esq.
Rev. R. F. Wheeler, M.A.
Prof. G. S. Brady, M.D.
H. B. Brady, Esq., F.R.S.
Rev. J. E. Leefe, M.A.
Rev. G. R. Hall, M.A., F.S.A.
G. H. Philipson, Esq., M.D.
Rev. R. E. Hooppell, LL.D.

Treasurer.

Robert Y. Green.

Honorary Secretaries.

Richard Howse.
Thomas Thompson.

Committee.

James Clephan.
William Maling.
William Dinning.
Jno. R. Young.
Edward C. Robson.
John Glover.
T. W. Backhouse.
T. T. Clarke.
John T. Thompson.
Joseph Blacklock.
Rev. J. M. Hick.
Henry C. Abbs.

Auditors.

J. S. Forster.
T. P. Barkas.

X.—*Miscellanea.*

Remarkable Instinct in a Foxhound.—"Abelard," a Foxhound, four years of age, was brought up at Greening Kennels, near Lesbury. He was never from home except at exercise and out hunting. On the 4th of April, 1882, he was taken to Corbridge by train, and from thence to the Tynedale Kennels, a distance of about fifty miles, where he arrived safely, and remained there from the 4th until the 10th. On the 10th of April, at four P.M., he escaped out of the grass yard. Next morning, at 6.10 A.M., he was seen in the kennel field at Greening.

The Hounds having left the kennels that morning at six A.M. to meet at Titlington Hall, about nine miles from home, they first drew Beanley Wood, and found, but could not do much, as scent was bad in covert. A second Fox was found on the moor, and after a fast run of twenty minutes returned to the wood, and got to ground. When the Hounds were drawn out of covert "Abelard" came out with them. A third Fox was found on the moor, and killed after a good hour and ten minutes, "Abelard" running at the head of the pack as usual all the time. Had another slow hunting run to ground, after which the Hounds returned home, arriving at the kennels at five P.M.

The Hounds went to covert through the Park at Alnwick, the huntsman locking the door in the Park wall after him. "Abelard" therefore, in going from Greening to Titlington, could not have followed precisely in their track.—*Communicated by Earl Percy.*

On a Perched Block of Sandstone in Lunedale.—In June of the last year, 1881, when the Tyneside Field Club visited Middleton-in-Teesdale, High Force, and the neighbourhood, a Block of Stone attracted the attention of several of the party in journeying through Lunedale. This block is a noticeable one, upon the gently sloping surface of a field, on the north side of the road from Middleton to Brough in Westmorland, by way of the bridge called that of "The Grains of the Beck." This bridge

is within five or six miles of Brough, and about the same distance from Middleton. It lies near to the base of Mickle Fell, which was ascended by some of the party. While waiting their return, one or two of the members walked back towards Middleton and examined the stone which had been noticed on the outward journey. It was found to be about forty or fifty yards from the road, resting on the surface of the field, and not imbedded in the soil as boulders and other detached blocks are usually found. It was also found to consist of *Sandstone*, and standing on a bare "scalp" of Limestone, resting on a point, so to speak, the upper part of the block overhanging the base on all sides. The surface of the limestone beneath being bare and free from grass, the winds no doubt keeping down any accumulation of soil which might be otherwise disposed to gather upon it. The locality of the stone may be about three miles from Middleton.

In size the block is about ten feet on the sides, and the same in height. The sides and lower part have marks of a scratching or grinding process having been undergone. These marks differ entirely from those of lamination or stratification which might be expected in a block of sandstone.

The question which arises is: How this block of sandstone comes to be where it is? It is entirely unconnected with any surrounding rock except what it rests on. It is quite out of the question to suppose it has been placed there by human agency. There might be an idea that this particular block forms part of a stratum of sandstone which originally was deposited on the limestone, but afterwards removed by denudation. If so this involves the idea of a very large and extensive area having disappeared, leaving no vestige but this comparatively small block. This opinion consequently appears untenable. The conclusion is that the block has been transported hither from some other locality, and that this occurred in that long past epoch of geological history called the "glacial period" or great "Ice-Age," which is supposed to have existed about 10,500 years ago.*

The composition of the rock is that of the ordinary sandstone

* See "The Great Ice-Age," by J. Geikie, F.G.S., pp. 121—130, etc.

of the north of England, of a very fine grain; and so far as this goes, we might assume that its original locality was not very far off from where it now is. Even if this were so, however, the question of the means of its removal would still remain to be considered. But taking into account the scratches and marks of grinding on the sides of the block, we are driven to infer that it must have been brought from a considerable distance, passing in its journey, while imbedded in ice, through ravines with walls and floors of harder kinds of rock, and grinding and scraping against them.

The history of the block then may have been as follows: We need not go back to the time when the grains of sand were in a loose and uncompacted state. We may take its history up when it formed, as it no doubt once did, part of an ordinary stratum of freestone, forming probably the upper part of the walls of a ravine. It would become detached by alternate rains and frosts, and roll down into the ravine, where it would get covered with snow, which would partially thaw and then freeze again, until the stone became covered and firmly imbedded in ice. This ice would increase in thickness and form in time a glacier, which would in the usual way be forced forward slowly but surely by the accumulation of ice in the upper part of the head of the ravine. The ice would still hold in its grasp our hero of a block, and many others beside, grinding it against the rocky ravine floor and walls in its progress, until the glacier reached the waters of a then-existing sea, and entering it for a short distance, the buoyant power of the water would "snap off" the end of the glacier which would then become an iceberg, free to float and wander about on the ocean at "its own sweet will," or rather at the mercy of the winds and currents, until another process set in, namely, the melting of the ice by the greater warmth of the water. This would set free our block and its companions, and they would drop plumb down on to the ocean bed, and remain there until some other force again should shift them.

In this way I account for the present position of this block of stone in Lunedale. It seems to agree with the opinion well known and frequently expressed that all our hills and dales,

ravines and fells, high as they are now above the sea level, were once submerged beneath the waters of an ocean, and were formed and moulded by the Polar Ice Cap.

Besides the scratchings on the sides of the block, the generally rounded appearance of its outlines indicates the grinding process and ice action. This roundness might be of course owing partly to exposure to ordinary weather during the long ages it must have been where it now is. This cause, however, does not appear to have had much effect, moss or lichens cover great part of the stone, which is sound and good, and shews no symptom of decay or disintegration.—*Septimus Oswald.*

A New Lichen found in Northumberland.—In a gathering of Lichens made at Bywell, Northumberland, the following new species was found:—*Lecanora albo-lutescens* (Nylander). The thallus is white, or between white and grey; its growth seems to be from white at first to a bluish-grey in age. It is closely adherent, indeterminate, and thinly scattered. The apothecia are waxy, orange-red, concave, with a thick proper margin, growing paler outward until it blends with the subtending thalline margin. The centre of the apothecium is sometimes furnished with an umbo, and the margin often flexuose. The hypothecium is pale, paraphyses moderate, free. Spores are eight in number, polari-bilocular, ellipsoid; polar cells large, with a distinct connecting tube. Thallus R. C., apothecia R. deep crimson.

This Lichen was found on sandstone rocks, by the Tyne side, a little below Bywell Bridge. We submitted it to Dr. Nylander, Paris, who named it, and whose description of it may be seen in "Grevillea" for Sept., 1881. He thinks it probable that this plant is descended from *Lecanora Turneriana;* it resembles the latter in the form of its spores, but there is a marked difference between the two lichens. *L. Turneriana* has a darker and denser thallus, with apothecia darker and less peculiar in form.—*Rev. W. Johnson.*

Notice of Salmon Trout in Ouseburn, Newcastle-on-Tyne, in the Spawning Season.—On the 13th November, as Mr. R. B. Bowman

and I were walking across the bridge over the Ouseburn at Benton Bank our attention was called by some persons looking at some fish in the water. The fish were apparently spawning, or had spawned. There was barely water sufficient to cover the fish, for sometimes their dorsal fin was out of the water. The fish were quiet for a time, and every now and then there was a rush, as though they were driving enemies away, who had come to eat or feed on the spawn. From the appearance of the fish and their size, the water not being clear, I should say they were Salmon Trout; although it is well known that there are Burn Trout in the Ouseburn, which I have seen, but much higher up the stream.—*R. Y. Green, Newcastle-upon-Tyne, 14th Nov.*, 1881.

Additions to the Local Fauna and Flora, with Remarks on some New Habitats, etc.—Assuming that any addition to the Fauna and Flora of this district is a matter of interest to members of the "Tyneside Naturalists' Field Club," I submit the following notes for their consideration, believing that they contain some observations not previously recorded in local Natural History catalogues.

The margin for such additions necessarily narrows with each new discovery, especially when it is remembered that the habitats are already well known of almost every conspicuous object, hence this rapidly contracting field of research may eventually be restricted to organisms incapable of being dealt with excepting by the aid of the microscope. I am so far fortunate, that in this contribution the individuals enumerated do not all require optical assistance for their determination, although in the investigation of their minuter details this is rendered imperative.

Alcyonella.—In overhauling some Anacharis, dragged from a pond near to the "Fox and Hounds" at Benwell Bank Top, in September of 1878, Mr. John Ridsdale and the writer found two well developed specimens of some Polyzoon, which, on examination and reference to Professor Allman's "British Freshwater Polyzoa," was suspected to be *Alcyonella stagnorum:* other examples were subsequently obtained and submitted for determination to Professor G. S. Brady, who replied, "Many thanks

for the beautiful specimen of *Alcyonella*, which reached me quite safely; to me a most interesting addition to the local fauna."*

The specimens retained continued to exist with me for a few weeks in a small aquarium then naturally died, the polypariæ becoming infested with a mixed and innumerable population of Annelids, Monads and Bacteria, while the surface of the water and margin of containing vessel became covered with statoblasts; these were suffered to remain undisturbed over winter. In the following June many of these resting eggs opened as bivalves, and the young Polyzoons appeared with exserted tentacles while still attached to the shells; the endless ciliary action and constant play of the floral like crown, together with its translucence and consequent visibility of structure, renders this creature a most charming and instructive object.

A second habitat was detected in the summer of 1881 by Mr. J. S. B. Bell, on the south wall of a cattle pond near to Fenham Gates on the Nuns Moor. Notwithstanding that the water is usually rendered turbid and muddy by the trampling of cattle, the organism was developed in profusion, the wall being literally plastered with it. The thickness of the mass showed that the new Polyparies were formed upon the debris of the old ones; when last examined it still remained vigorous and abundant.

Paludicella procumbens.—This rare Polyzoon, figured and described for the first time by the late Mr. Albany Hancock in the first Vol. of this Society's "Transactions," was obtained from its old habitat in Broomley Lough in 1878, as described, on the under side of stones; there is, however, considerable difficulty in finding it.

Hydra.—I noticed upon an aquatic plant, gathered from a pool in Jesmond Dene, several examples of a beautiful pearly white Hydra, side by side with the ordinary *H. viridis*. Although it may have been a mere variety of the latter, the contour was different and the size larger. I left some of the specimens, together with another which appeared upon some *Chara* taken from Broomley Lough, at the Museum of the Natural History Society. There was no difficulty in identifying the last as the variety

* See Note, p. 189, infra

described in the first vol. of this Society's "Transactions" by the late Mr. Hancock. I note this as showing persistence of habitat.

Uvella.—Mr. John Ridsdale took a gathering of a yellowish flocculent deposit from a pool near the east wall of St. Nicholas' Cemetery on the Nuns Moor. On examination this proved to be *Uvella*, not an uncommon organism, but remarkable in being a nearly pure gathering, covering the entire bottom of the pool.

Euglena.—The surface of a field pond, a little to the west of Ryton, was covered in July, 1878, with a reddish brown pellicle, only broken at the margin where the cattle had stooped to drink, and certainly a nursery for the development of parasites, inimical to the existence of the animals which were compelled to have recourse to it. This pellicle was composed of *Euglena sanguinea*, an organism regarded by Griffith and Henfrew as the perfect *E. viridis.*

A gathering was preserved over the winter and periodically examined. In assuming the still form it sunk to the bottom of the containing vessel, each individual gradually becoming mottled with green and ultimately losing all trace of red; it then propagated itself by segmentation and division, and ultimately reappeared as the ordinary *E. viridis.*

Mr. George Harkus called my attention to a curious variety, if it be a variety, which he found on the Town Moor, in which the flagellum was tipped with a distinct bulbous termination. This is figured in W. Saville Kent's "Manual of the Infusoria," plate 20, figure 29.

Nitella, probably *flexilis*, was first observed amongst some *Anacharis* (*Elodea Canadense*) in 1874, growing in the ditch skirting the northern edge of the Town Moor, a little way west of the Grand Stand near to the field path leading from the Moor to Kenton. This ditch was prolific in *Algæ;* the grouping together of many uncommon forms seems remarkable, as, if not actually rare, their detection would have covered a wide area had they been specially sought for.

Here *Nitella* appeared at intervals in bright green clumps, apparently well suited with the clayey bottom of the runner. Mr. John Ridsdale afterwards found a luxuriant growth of this plant

in the immediate neighbourhood, but in private ground. Owing to its total disappearance from the first habitat, we think it unadvisable to reveal the exact position of the second one. I have however this year fished it out of Crag Lough. *Nitella* is especially valuable for showing the rotation or cyclosis of its sap with beautiful distinctness, and, if kept moderately warm, at all seasons.

Nostoc.—In the same ditch, for three years in succession, there appeared an abundant growth of *Nostoc*, many examples reaching the size of a small plum: these covered submerged stones, and were also attached to aquatic plants and grass dipping in the water. In 1878 although numerous, the *Nostocs* did not attain the size of their predecessors, and were only found after a careful search.

Batrachospermum moniliforme was also common here, clinging to the bottom and forming a slimy covering to sticks, stones, and the clayey sides of the runner.

Chætophora elegans may also be noted as occurring in the same habitat, together with *Draparnaldia glomerata.*

Fontinalis antipyretica was also found adherent to submerged stones.

Volvox globator.—At Ryton Willows. This habitat was recorded many years ago by Mr. now Professor G. S. Brady. It also appeared plentifully in two ponds at Benwell Bank Top in 1878: also in the present year at Croxdale.

Chætophora endivifolia.—Attached to decaying stems of *Equisetum* in a pond at Sugley Field, Lemington.

Hydrocharis morsus-ranæ.—The Frogbit still appears abundantly in its old habitat near Ryton Station. I am not aware that it has been found elsewhere in this district.

Cystopteris dentata.—Along the walls skirting the military road to the south of Crag Lough, there is a free growth of *C. fragilis*, and with it is another species or variety. I dried and sent fronds of each kind to the editor of "Hardwick's Science Gossip" for determination, and elicited the following reply in No. 152, August 1st, 1877: "Your specimens are very interesting. No. 1, *Cystopteris dentata;* No. 2, *C. fragilis.* They are

now generally merged into a single species, though Francis named them as above."

To sum up, I conclude that *Alcyonella stagnorum*, *Nitella*, and *Cystopteris dentata* are additions to the list of local Natural History objects.*

Paludicella procumbens and the light tinted *Hydra* found in Broomley Lough; *Volvox globator*, and *Hydrochoris morsus-ranæ*, have been catalogued and published in the "Transactions" of this Society many years ago: their introduction here is intended to confirm previous observations and indicate persistence of habitat. And that new habitats may be claimed for *Nostoc*, *Volvox globator*, *Batrachospermum moniliforme*, *Chætophora endivifolia*, *C. elegans*, *Draparnaldia glomerata*, and *Fontinalis antipyretica*.

In conclusion, I may remark, that nearly all the examples enumerated were detected while searching for something else, and that everything suspected to be new or unknown was submitted to competent authorities for determination.—*M. H. Robson*, Hon. Sec., *North of England Microscopical Society*, *December*, 1883.

* *Alcyonella stagnorum* was discovered at Howick, Northumberland, by Mr. R. Embleton more than fifty years ago. It is recorded in the first edition of Dr. Johnston's "Zoophytes;" and in Mr. Alder's "Catalogue of the Zoophytes of Northumberland and Durham." See "Trans. Tyneside Nat. Field Club," Vol. I., pp. 271, 316, 368, and Vol. III., p. 159. Ed.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ BY THE PRESIDENT, REV. CANON WHEELER, M.A., AT THE THIRTY-SEVENTH ANNIVERSARY MEETING, HELD IN THE MUSEUM OF THE NATURAL HISTORY SOCIETY, NEWCASTLE-UPON-TYNE, ON FRIDAY, MAY 11TH, 1883.

LADIES AND GENTLEMEN,—It is again once more both my pleasure and my duty, as your President, to sum up the proceedings of the Club during the year of office which closes for me to-day. When you again elected me to fill the post I felt that you did me an honour which I little deserved.

Our FIRST FIELD MEETING was held at Blanchland on Whit Monday. A very numerous party assembled at the Central Station, Newcastle; some joined us in the hope that they would have the double enjoyment which beautiful scenery ever affords, and at the same time profit by the knowledge they might gain from those who had become more deeply learned in the great book of Nature than they themselves were.

The forethought of our excellent and indefatigable honorary Secretaries had provided even for such a gathering, and carriage accommodation in ample abundance was awaiting us on our arrival at Benfieldside Station. The drive thence to Blanchland was all that could be desired. Sunny skies, pleasant companions, beautiful scenery, all combined to enhance our pleasure and to crowd our memories with happy recollections. The antiquarian, the historian, and the naturalist alike found an ample field for the gratification of their various tastes and inclinations at Blanchland.

The days when the Norman ruled in England seemed almost to live before us as we wandered around the site of an old Premonstratensian Abbey, founded by Walter de Bolbec in 1175. One could picture the abbey with its monks in their best and most prosperous days, their learning, their care for the poor, and the one bright centre of civilization and culture which the abbey

then formed amidst the rough and rude dwellers around. Then little by little early zeal decaying, and errors neither light or trivial creeping in. Then the sweeping whirlwind of Reforming times, destroying the monastic life, and iconoclastic hands levelling the work of the skilled Norman builders to the ground. Then happier times again arising, and good Bishop Crewe leaving his estate to trustees, in the hope that the generation yet unborn might profit both in body and mind by the generous disposition of his property and by the teaching given in the church and schools which he so founded and endowed.

We wandered in happy groups of twos and threes o'er field, and stream, and wood, gathering as we went here a flower and there a moss, rare and beautiful to the eyes of the unlearned botanists, who, ignorant alike of the mysteries of the Natural or Linnean systems, enjoyed possibly with even keener relish than their more learned companions, the beautiful works of Him who has clothed the Lily of the field with its glorious colouring, and made everything beautiful in its season.

But neither history, archæology, botany, or any other kindred science will satisfy the needs of whole man (body as well as mind must be cared for), and here again the forethought of our excellent and painstaking Secretaries were made clearly evident by the ample repast which the keeper of the inn had provided. Mr. Thompson, after dinner was ended, gave us some interesting notes on certain eggs which he had recently found. Our homeward journey was without any special incident.

The next Meeting was at High Force, in Teesdale. A region of deepmost interest to the plant collector from the peculiar flora which marks, or did mark, its vegetation. Alas! "the trail of the Tripper" has left its mark even on the lengthening miles through which Tees rushes from the moment when it springs into life, near to its even more famous twin sister, the Tyne, down to its exit into the sea.

The ruthless destruction of plants, too often from mere thoughtlessness, is becoming a very serious evil. Even amongst the mountains of Switzerland the destruction of rare plants has been

as marked as in England, and consequently in some parts whole sections of country have been closed to ordinary visitors. But it is not only the visitor and the plant collector for botanical purposes who are the sinners in this matter. A regular trade is carried on by the Swiss in beautiful Saxifrages, Sempervivums, Ferns, and other rare plants by persons who make it their business to seek them for sale. So great has this evil become that, I am informed, very recently measures have been taken to prevent the exposure for sale of such plants in the markets of Geneva.

Our members on this occasion gathered in no great numbers. But the party was a very pleasant one. Cronkley Scar and the parts close at hand were those which formed the centre of attraction on the first day.

On the second our plans were laid further afield, and so first Cauldron Snout, then the Moor Farm at Birkdale, and up the Maize Beck to High Cup Nick, were the places to which our thoughts and our hopes tended.

A beautiful morning ushered in a bright but not over warm day, and merrily we sped onwards, after paying our reckoning and saying farewell to the obliging host of the capital inn at High Force. The walk was extremely pleasant, and close attention was paid by some of our party to the peculiarities of the strata through which the Tees and Maize Beck force their way, while others were not less pleased by forming the acquaintance of some of the more rare plants growing on the moorland side.

A most welcome lunch of simple fare was procured at Birkdale, and so we reached the Nick just as gathering clouds warned us that a storm was not far off, and the distant thunder warned us not to linger.

> "Far along,
> From peak to peak, the rattling crags among,
> Leaps the live thunder, not from one lone cloud,
> But every mountain now hath found a tongue."

The brunt of the storm did not reach us, but broke with great fury over Weardale.

A visit to High Cup Nick had been a long-desired purpose with some of our party, and it seemed to them almost like the realization of a day dream, as they stood on the edge of the ridge of that wondrous gap, looked along the valley, and saw far off the distant panorama of Westmoreland. They felt as if the half had not been told them. It is a view in England once seen never to be forgotten. True, a mist had gathered over the distant hills and shut out much, but enough remained to write down the moments we spent there deep in memory's tablets. But we could not linger, as we gladly would have done, for the day was waning to its close, and many a mile yet lay before us ere we could reach our homes. So pressing on o'er fell and crag we reached the Farm at Harwood Flats, where conveyances were waiting to take us on to Appleby. A good and substantial tea at the King's Head gave new impulse to our energies, and after a very beautiful railway ride we separated at Barnard Castle, some to return to their daily toil, others to go back again to High Force.

I was not present at the two following Meetings, as a long previously arranged journey to the Black Forest and Switzerland rendered my absence from England necessary. But the Club will be no loser by one of those excursions. A very interesting narrative of the one to the Yorkshire Caves and Craven, drawn up by Mr. T. T. Clarke, will be found in the present volume of our Transactions, page 50.

The excursion to St. Mary's Loch, in Selkirkshire, did not draw many together. Some twelve members only were present. On the second day the source of the Tweed was visited, and on the homeward journey some of the party lingered awhile in the interesting border city of Carlisle.

And so we bade farewell, for this season at least,

. . . . . to the pastures
So sunny and bright!
The herdsman must leave you
When summer takes flight.

We shall come to the mountains again when the voice
Of the cuckoo is heard, bidding all things rejoice,
When the earth dons her fairest and freshest array,
And the streamlets are flowing in beautiful May.

Ye pastures and meadows,
Farewell then once more!
The herdsman must go,
For the summer is o'er.

The October Meeting, as usual the last of the series, was held near home. The members met at North Shields, and under the kind and able guidance of J. F. Spence, Esq., proceeded to visit the Fish Quay, and to inspect the very important works which the Corporation of Tynemouth have carried out of late years. To any one interested in the fauna, aye and even in the flora of the sea, our visit to the Fish Quay was a source of great gratification. Most willingly were the spoils of the trawler's net and the captures of the fisherman's hook submitted for our inspection, and some were inclined to linger on beyond the last allotted moment. A few specimens were found worthy of selection for a place in the Museum of Natural History, while others were taken to less ambitious collections. After leaving the Fish Quay we proceeded along the river margin to the Salt Works. We were most courteously and kindly shewn over them by Mr. Ogilvie, the present proprietor, who explained the whole process of salt making.

This is now the last surviving portion of what was once a great industry at Shields, and the neighbouring villages of Cullercoats and Hartley.

I have no facts at hand to enable me to speak accurately of the trade in salt from Shields, but from some memoranda I possess, I find that in 1706 one Thomas Fearon, of Cullercoats, leased a portion of land at Cullercoats, for the purpose of erecting salt pans thereon, "together with free liberty at all times to load, ship, and send away any quantity of salt which the said Thomas Fearon should make in the said salt pans." That there were salt works there long before the date of the above lease

there can be no doubt, nor that the manufacture on a considerable scale was carried on, for I find from the records of the Custom House at Blyth that in the Michaelmas quarter of 1723, 1962 tons of salt were exported from the then small harbour and port of Cullercoats.

Leaving the Salt Works the party proceeded along the shore towards the Tyne Pier works, and so to Cullercoats, where tea was provided at the Huddlestone Arms. After tea Mr. Clarke read the paper, already referred to, on the Caves of Yorkshire and the features of the Craven District.

So ended our Field Meetings for 1882.

I have often wished that our out-door gatherings were of more practical use, in an educational point of view, than they are; and that by some arrangement some one or more friends conversant with the special features of the Natural History of the place to be visited could always be the leader and guide, or guides, of those who wished to add to their store of knowledge. If by any means this could be done I am sure it would add at once to the usefulness and the popularity of the Club. No field which comes within the scope of the Naturalist's work but affords "fresh fields and pastures, ever new," for his research and his labour. Take, for example, Botany. I cannot claim any special or deep knowledge of this subject, and I am quite sure that many members of our Club have a far greater and more accurate acquaintance with that interesting study than I have, but possibly I may still be pardoned if I venture to present a few thoughts which have occurred to me.

When in Switzerland last year my attention was drawn to what is, to me, a deeply interesting branch of the botanist's labour, and one, as far as I know, almost unworked. It is the influence which man has exercised on Plant life. Viewed from one point a moment's consideration will show that this is obvious enough, but in another the facts are far less striking, though possibly more instructive.

In centuries long long passed away how different an aspect did these islands present in their woodland scenery. Many of

our most familiar trees were then altogether unknown to the dwellers in Britain. Very few, save those whose thoughts have been given to Arboriculture, know how much the beauty of our land has been enhanced by the introduction and naturalization of trees from far distant climes. The Spruce Fir or dark Norway Spruce, *Abies excelsa*, was not known here some three hundred years since. It was well known in Norway, in Switzerland, and is found in countries stretching from Cape Clear to Behring's Straits. The Silver Fir, *Abies pectinata*, is even a more recent introduction, though nearly contemporary with the Spruce.

In the Park at Alnwick there are some noble specimens; and in the Duke of Argyle's place at Roseneath, on the Clyde, there are, or were, Silver Firs about 170 years old and 140 feet high. No other British tree rears its head heavenward so loftily as this.

The Larch, with its exquisite green leaves put forth in early spring, but so bare and desolate in winter, is but a modern friend. Its introduction is memorable as being coupled with the rebellion of 1745. It was James Duke of Athole who first planted it to any extent.

But not to weary you with more examples of trees of whose introduction a certain record exists. For who knows not some of those which have of late years been introduced into our gardens and our shrubberies from far away lands? Some of them hereafter may perhaps become as common and as useful as the Larch, the Silver Fir, or the Spruce.

There are other trees about whose incoming we know nothing, save that there was a period when their present home knew them not. It is very hard to realise that they too owe their presence among us to man's skill and energy. The Elm, so identified in song and story with our village gatherings, was once unknown in Britain. We know not when it first rooted itself in English soil (it is supposed the Romans introduced it), but we know from our fossil forests and in other ways when it was not amongst us.

A reverse side to this picture might also be worked out.

There are trees once very common, but are now comparatively rare. They have ceased to be cared for and esteemed because there is no longer the use for their wood which was once the

case. The Yew is a well known instance of this. In the days when the battles of Crecy and Poitiers were fought and won, it was by the English archers' skill that the victory was mainly achieved. The bows were of Yew. And great must have been the consumption of wood, and vast the destruction of such a slow growing tree as the Yew, to meet the demands of the army in Edward the Third's days. Thus in 1341 we find a proclamation sent* forth ordering a large number of bows and arrows, "because we want many bows and arrows for an expedition against France, which we have taken in strong hand." There were ordered 7,300 bows, 14,550 sheaves of arrows, each containing 24 (thus giving about four dozen rounds for each bow), 2,000 separate heads for the arrows, and 50 dozen cords for the bows. They were to be paid for at 12d. each; each sheaf of arrows with sharp heads 14d., and without 12d.

This, considering the great difference of the purchasing power of money in those days and in ours, seems a high price.

The invention of gunpowder and muskets erelong rendered the bow an obsolete weapon, and with the bow the Yew fell into comparative disuse. For centuries afterwards it was the wood from which better class spoons were made, the Beech or the Sycamore furnishing that for commoner ones; but now, as a Kentish farmer not long since remarked to me, even its value for that purpose was gone. The iron and the nickel spoon have banished the yew one to the regions of flint and steel tinder boxes and other like commodities.

But there is a field of observation, which neither strikes the mind or the eye so readily as this, less obvious, less easy to work out, but fully as interesting.

The humble plants which are found in the field, or on the mountain slope, by the edge of the dusty road, or in the marshy pool, how came they there? Are they wanderers from some far off clime? from some neighbouring country? or have they always been dwellers in this land?

Let us take an instance or two in point, which may act as finger posts to guide us in our enquiries.

* Longman's "Edward III.," Vol. I., p. 167.

Switzerland, like other lands, has been largely intersected by railways, and one of the best known of those lines is that which carries the traveller, eager for the sunny skies of Italy, from Geneva along the shores of beautiful Lake Leman to the foot of the Simplon Pass. Before that line was constructed there was a flora quite peculiar to the Rhone Valley between Sion and the Lake. I believe that I am perfectly correct in saying that nowhere else in Switzerland were some of the plants to be found. But of late years those plants, or some of them, have become not uncommon in districts far removed from their original habitat. How has this been effected? Have the seeds availed themselves, like man, of the mighty steam horse to emigrate to other, and possibly more congenial, lands? How else can the formation of the road have brought about this result? That the seeds have been conveyed by human hands is altogether out of the question. If the railroad has been the means of widening the area of the growth of these particular plants, may not the older and slower ways of locomotion have been used to the same purpose?

That certain plants do follow man's footsteps admits of no doubt. Thus the Indians of North America call the common Plantain the "White man's foot," because it invariably follows the footsteps of Europeans. This is familiar to many from the way in which Longfellow speaks of it in the Song of Hiawatha—

> "Where'er they tread, beneath them
> Springs a flower unknown among us,
> Springs the white man's foot in blossom."

Again, the New Zealander calls the Chickweed "The mark of the pale face;" and the Yellow Sorrel of the Cape is known in Malta as "The Englishman's plant." And yet, I suppose, no one can entertain the idea for one moment that these plants have been purposely introduced by man into these lands. No loving attachment, as in the case of the Scotchman to the Thistle, exists in any mind, so far as I am aware, to any of them. Indeed, as a most thoughtful and eloquent writer well puts it,* "It is a law of Nature that plants should be diffused as widely as possible

* Hugh Macmillan.

wherever the circumstances are favourable to their growth. . . . . But man interferes with this law in his processes of gardening and horticulture. His object is to cultivate beautiful or useful plants within enclosures, from which all other plants are excluded. He wishes to separate from the struggle of the elements, and from the competition of other species, certain kinds of flowers or vegetables which are good for food or pleasant to the eye. In this he is only partially successful, for into that plot of ground which he has set apart from the waste common of Nature a large number of plants intrude, and with them he has to war a constant warfare. These plants are known by the name of weeds. . . . . There is one peculiarity about weeds . . . they only appear on ground . . . which has been disturbed by man. . . . . Have these plants always been weeds? If not, where is their native country? No satisfactory answers can be given to these questions. . . Most of our weeds possess all the characteristics of a desert flora, special adaption to a dry soil and arid climate. The Dock and the Dandelion have long tap roots, the object of which is to store up a supply of water, enabling the plants possessing them to live through a long rainless period, and in spots from which moisture has vanished. . . . . The Dead Nettle is covered with a silky hair, a provision made to attract the moisture of the air, and so to counteract the drought of the circumstances in which it grows."

But this subject may be carried yet further. It not only pertains to the weeds of the gardens. But the question naturally arises where is the true, the original, the native home of each and all the various forms of vegetation which clothe the mountains of Switzerland, which are the distinctive flora of the wild and uncultivated parts of our own country, our moors, our fens, as far as they exist still, our hills, and our mountains. The glowing Poppy, the lovely blue Cornflower, and others found amongst corn crops, which seem to speak to us, by the brightness and glory of their colour, of lands of unclouded sunshine. They have wandered, who can say how, far from their native home, and emigrating, have given a beauty to our fields

which we do not realise, simply because we have never thought about it.

Another consideration ere I turn to a different subject. Every one knows that some plants are few and far between in their homes. How the ardent plant collector revels when his good fortune enables him to gather one of them, only to imprison it amidst the dingy folds of his drying book! These plants are either, may we not think so? the stragglers of an army in retreat or the scouts of an army in invasion. It is by no chance, but by some law, which needs more observation than has been given to it, that these rarities find their resting place. Again, how can we account for the leaps and bounds which some plants sometimes seem to have made. Their home easily traced many many hundreds of miles away; but a colony has been clearly established in some remote far away spot, no intermediate station being traceable. Thus at Roche, in the canton Vaud, in Switzerland, in a wild forest, a Cyclamen, whose home is Italy, sometimes known as the Cyclamen of Naples, is found in comparative abundance. Nowhere else is it to be seen wild on the north side of the Alps. What has brought it to Roche? Whence came it previously? How has it overstepped the lofty Alpine summits? Again, the beautiful *Hierochloe borealis* was found a few years since for the first time growing in the Isle of Limmat, a few miles below Zürich. No other specimen was known. A little while afterwards it was found growing near Einsiedlin, the well known great pilgrimage route, from whence the torrent Sihl rushes down through most picturesque gorges to the Lake of Zürich. The suggestion naturally presented itself to the mind, "Oh, the seeds have evidently been conveyed by water to Limmat, on the lower part of the Lake," and it is reasonable to think so. But then the question comes, How was it introduced to Einsiedlin? The place nearest to Einsiedlin where it is known is Munich, and even around there it passes as a rare plant. To find it in abundance one must go to the far north, towards the coast of the Baltic.

But I must pause, deeply interesting as such an enquiry as the present one is, for if the pen were allowed to run on and

one's thoughts to dwell on all the analogous cases, we should not reckon them by scores but by hundreds; and so we must bid adieu to the plants of the field and the flowers of the forest and turn to the mighty ocean.

> "There is a pleasure in the pathless woods,
> There is a rapture on the lonely shore,
> There is society, where none intrudes,
> By the deep sea, and music in its roar:
> I love not man the less, but Nature more."

The mysteries of the depths of the ocean have, of late years, been revealed to a very great extent by the researches made by the officers of the "Challenger" and other like expeditions. The magnificent volumes, which are being issued at distant intervals, giving the results of the observations of the "Challenger" naturalists, will when completed, form an unequalled monument at once of patient labour and accurate research.

Years ago Dr. Carpenter very pertinently remarked that "the foundation of the whole of geological science, that is the interpretation of the phenomena presented to us in the study of the earth's crust, must be based upon the study of the changes at present going on upon the surface of the earth, including, of course, the depths of the sea." But true as this has been ever since geology became a science, still it is only in very recent times that it has been possible to investigate, with any approach to accuracy, any but the shallower seas.

It is to submarine telegraphy that we owe the first systematic attempts at deep-sea soundings. It was obviously necessary, for the purpose of laying the cable which first, as by a thin line, united Europe with the continent of America, to ascertain beforehand the depths of the ocean, and also the nature of its bottom. Commander Dayman's expedition in 1857 may justly be considered as the pioneer of all subsequent explorations.

It would be altogether out of place, in a brief address like the present, to enter more fully into the history of the investigations carried on by Sir Wyville Thomson, Count Pourtales, the Swedish Spitzbergen expedition, and others. Before these observations were made it was a commonly received belief that the

sea had a uniform temperature below a certain depth, of 39° F., and that the zero of animal life was reached at a depth of 300 fathoms. But the deepest soundings show a lower temperature than that. Indeed the temperature of 39° would appear to be confined to a depth not exceeding 1000 fathoms.

The average depth of the ocean, as ascertained from the "Challenger" observations, is two and a half miles, or 13,000 feet. The deepest sounding of the "Challenger" was 4,475 fathoms, but this has since been exceeded off the coast of South America by a recent American observation. These long-extended and most varied and accurate enquiries have thrown a new interest around the subject of the dwellers in ocean depths, and have very widely extended the range of our knowledge.

Mr. Murray, in the "Proceedings of the Royal Society,"* has classified the deposits met with during the "Challenger" voyage under the heads of Shore Deposits, Globigerina Ooze, Radiolarian and Diatomaceous Ooze, and Red Clays. The shore deposits are, of course, of less consequence and interest than those of the deep seas. The most interesting feature, probably, in the shore deposits is the abundance of Glauconite, or other green Silicate, which occurs as grains and as casts of the interior organisms whose tests have disappeared. The phenomenon is mainly confined to depths of less than 700 fathoms. Possibly there may be some connection between these Silicates and the Red Clays of the deeper ocean.

The Globigerina Ooze is not met with south of 50°, nor, probably, much beyond 60° N.; but within these limits it is, after the Deep-Sea Clays, the most abundant of oceanic deposits. It consists largely of the dead shells of Globigerina, Orbulina, and Pulverulina, etc. With regard to the rest of the calcareous elements of Globigerina Ooze much of it consists of "Coccoliths" and "Rhabdoliths." No one appears to know much about the organic position of these things. The Botanist and the Zoologist seem to regard them with equal suspicion. Whatever they are they secrete a large quantity of Carbonate of Lime.

Next we have the Radiolarian and Diatomaceous Ooze. The

* Vol. XXIV., p. 578.

siliceous deposits of organic origin are the result of Silica-secreting creatures, which abound on the surface waters, and also apparently in the deepest waters, of all the oceans and seas visited by the "Challenger." About half way between Japan and New Guinea there is a depth of 4,575 fathoms, the deepest "Challenger" sounding, with a bottom of Ooze, containing chiefly the remains of Radiolarians and Diatoms, and other deep sea Rhizopods. In this sounding there was a very small amount of amorphous clayey matter, and no Carbonate of Lime organisms are expressly mentioned.

As to the Red-Clay deposit, conspicuously *the* deep-sea deposit, the following analysis of a sample dried at 110°, from a sounding in 3,150 fathoms, will throw much light upon it.

Water and Organic Matter	10·40
Silica	53·30
Alumina	17·40
Ferride Oxide	11·70
Lime, Magnesia } in combination with Silica	1·35
Carbonate of Lime	3·10
Magnesia	1·90
Sulphate of Lime	0·85
	100·00

As to animal life in the deep sea, the most important question is, To what depths do living creatures descend? This is not capable of so simple an answer as might at first seem possible. Only a net which can be sent down securely closed, and then opened and towed along, and then closed again before being hauled up, can give any definite and sure information on the matter. Such a net is both difficult to construct and to use. Mr. Alexander Agassiz has, however, made a few experiments with such an instrument, and found, when he tried it off the American coast, that the animals extended down to about 50 fathoms' depth, but not at all below 100 fathoms. The problem as to how far this result is one which applies generally, is the most important with regard to deep-sea science now awaiting solution. It is still an open question whether any of the well

known Globigerinæ, of the shells of which the deep-sea Globigerina Ooze is chiefly made up, live at the bottom, or whether they are all Pelagic, and the shells only drop down to the bottom after death.

There can be no question that Globigerina Ooze and the deep-sea deposits are, in their ultimate derivation, products of the denudation of the earth's surface.

It is but a slight step indeed from the foregoing remarks to the subject of our Sea-Fisheries, which are at once such a fertile source of food to man, and such an attractive field of labour to the dwellers on our coasts. It is with no little satisfaction that I can refer to the part the Tyneside Field-Club has taken in bygone years in reference to this at once very interesting and important subject.

It is now more than twenty years since the subject of the then condition and prospect of our Sea-Fisheries was first-debated at an Evening Meeting of our Club. The information then drawn forth was all that was really known at the time, and little enough it was. Mr. Henry Fenwick, the then member for Sunderland, availing himself of the knowledge then gathered together, brought the subject before the House of Commons, and moved successfully, for the appointment of a Royal Commission. Professor Huxley, Mr. Caird, and Mr. Shaw-Lefevre were appointed Commissioners. They commenced their enquiry at Cullercoats, and afterwards proceeded to hold meetings at every fishing station in Great Britain and Ireland. A most able and exhaustive Report, together with all the evidence taken, was subsequently published. This is the foundation on which all subsequent enquiry has been based, and from this the present deep and widespread interest in our Fisheries has arisen; culminating, as it is now doing, in the great International Fishery Exhibition to be opened to-morrow in London.

Not only has there been a most plentiful supply of literary effort bestowed on this not so long ago altogether neglected subject, but attention has been directed by eminent Naturalists to the habits of Fish, and many most valuable additions to our knowledge as to the mode of spawning and feeding have resulted

from their observations. The Fishery laws have been altered, and the whole subject is now in a very different position indeed to what it was when our Club first took up the work. Surely we feel some slight gratification that the tiny seed has sprung up and borne such a useful and plentiful harvest!

Another field of investigation into the forces which are ever being exerted around us is being very earnestly worked, and rapidly developed, Meteorology. No subject attracts more general interest. For some years it was my fortune to render some small service to the Tyneside Club as Editor of the Meteorological Reports. The demands upon my time, from an ever-growing Parish and other work, compelled me, very reluctantly, to resign that office. To my deep regret, and to the loss of Science, by the breaking up of the able staff of observers, no one was found ready to take up the work, so well commenced and carried on by my predecessor, Mr. Mennell. A series of stations, practically covering the whole of the two counties of Durham and Northumberland, afforded opportunities of registering the phenomena of wind and weather, and of recording other natural phenomena, possibly without any parallel in other districts of England.

Had the Club been able to secure the services of an Editor, we should have had, in the course of a few years, such a mass of recorded facts as would have given us a knowledge of the peculiarities of our local climate not to be found elsewhere in our island. But vain are the regrets over lost opportunities! One can only hope that even yet some one may be found ready to resume the work, and with more leisure and far more ability to carry it on in future years.

It may now almost be said that Meteorology has been lifted from the depths of obscurity and contempt into the position of one of the highest branches of scientific research. Possibly no single step has been taken for many a year which is likely to lead to discoveries of greater interest and importance than the observations now being taken in the Arctic regions. Hitherto the information obtained from thence on meteorological subjects has been very incomplete. But it has also been felt that from

thence there were in store discoveries which would one day prove of the greatest value and importance. Amongst the few facts already ascertained is, that the lowest temperature does not coincide with the geographical pole, but is concentrated on two points; one in Siberia, the other in North America. It is to Lieut. Weyprecht, the discoverer of Franz Josef Land, that the world is indebted for the suggestion that the North Pole should be encircled by a series of fixed observatories, and that two stations should be established also in the Antarctic Seas. I have not the time, nor is this the place, to enter into the history of this movement. It must suffice to say that by the 1st of May, 1881, Professor Wild was enabled to say that the eight stations needed had been secured.

In July, 1881, at S. Petersburg, it was determined that the observations should be commenced at all stations in the Polar regions, as well as in those of the temperate zone, as soon as possible after August 1, 1882, and that they should be continued until September, 1883. The stations were finally allotted thus: Denmark has charge of Godthaab. America has her post in Lady Franklin Bay, in Smith Sound, the most northerly of all the stations. Germany in Cumberland Sound, and England at Fort Rae, near the Great Slave Lake. America has also a station at Point Barrow. Russia occupies the mouth of the Lena, and Holland takes Dickson's Haven. A Prussian branch station has also been established at Moller Bay, in Nova Zembla. Norway is responsible for the work at Bosekop, in the Alten Fjord. Sweden selected Spitzbergen; Austria, Jan Mayen Land; and a station has also been fitted up at Sodankylä, on the Scandinavian Isthmus. The Germans have also secured the help of the Moravian missionaries in Labrador, the coast there extending along the line of minimum depression. France has gone far afield, having established a post near Cape Horn; and a third German party is stationed on one of the islands of Southern Georgia, some 1,100 miles from Cape Horn. Materials for a comparison on a very extended scale will therefore be forthcoming from all parts of the world.

All meteorological and magnetic phenomena will be observed

hourly during the whole time, and on term days, 1st and 15th of each month, magnetic observations will be made every five minutes, and always at the same time during the 24 hours. The magnetic observations are intended to make us thoroughly acquainted with the phenomena of magnetic perturbations and storms, and their connection with the Aurora Borealis.

That the result of all these combined efforts will be greatly to advance the knowledge of the various agencies which control the condition of the atmosphere, and possibly to extend our knowledge of electrical and magnetic forces in directions altogether unexpected, there can be no doubt. The publication of the results will be looked forward to with intense interest, not only by the world of science but by others also who can scarcely be brought within that category.

But there is a field of observation open to every one in relation to the weather too little known. It is as to the indications which the higher clouds in their varying forms give us as to atmospheric disturbances which are impending.

Very recently the Hon. and Rev. F. A. Russell read a paper before the Meteorological Society, from which I venture to quote a few passages. "Next to frequent readings of the barometer, and a knowledge of the distribution of atmospheric pressure, cloud observations, especially of cirrus, were of great use in forecasting the state of the weather. Cirrus is generally supposed to float at heights varying from 16,000 to 40,000 feet and more. But according to Mr. Glaisher's balloon observations this height may probably be sometimes more than fifteen miles. Its appearance suggests electrical influence in the determination of form; it is the only cloud which is not normally rounded in outline, and which is sometimes composed of striæ, nearly at right angles to each other. It is also the only cloud which sometimes appears to radiate from a point near the horizon, thus showing the lines are parallel to each other, and their real length in their apparent direction."

No one amongst the dwellers on the coasts of Northumberland and Durham will have forgotten the unparalleled gale which swept so suddenly down upon us on October 14, 1881, and which

caused such fearful devastation everywhere. Uprooting countless trees in Northumberland and Scotland, trees which had braved storms for scores and scores of years. The fearful destruction of our ships and sailors will have written that sad day's work even more deeply and permanently on many a heart than the loss of property has done. The storm travelled with great rapidity, and broke upon the west coast during the night. The cirrus "observed on October 13," the day before the storm, "gave earlier information than the barometer of the coming gale. It may be stated generally that cirrus of a long, straight, feathery kind, with soft edges and outlines, or with soft delicate colours at sunset and sunrise, is a sign of fine weather. Curly wisps and brown back pieces are not a bad sign, but their exact appearance should be noted. . . . . The harder and more distinct the outline, and the more some particular forms are repeated, the worse the results."

It is, however, full time that I drew this address to a conclusion.

Look where we will, either in the heavens above us, with the bright and glorious suns and stars, which form the field of the astronomer's investigation, or down to the deepmost valleys of the ocean, all, all tell the same lesson, how stupendous are the works of Him who made them all. How each fresh peep into mighty and beautiful works of Creation does but open the door to further search, and reveal treasures of knowledge before altogether unsuspected. Only let us pursue our investigation as simple searchers after Truth, not as those who seek for facts in order to support some strongly conceived and foregone conclusion, and to bolster up and strengthen some pet theory, or as Lord Bacon long, long ago wrote:—"Truth, which only doth judge itself, teacheth, that the inquiry of Truth, which is the love making, or wooing of it, the knowledge of Truth, which is the presence of it, and the belief of Truth, which is the enjoying of it, is the sovereign good of human nature. The first creature of God, in the works of the days, was the light of the sense: the last was the light of reason: and His Sabbath work, ever since, is the illumination of His Spirit. First He breathed light upon

the face of matter or chaos; then He breathed light into the face of man; and still He breatheth and inspireth light into the face of His chosen. The poet that beautified the sect, that was otherwise inferior to the rest, saith yet exceedingly well, 'It is a pleasure to stand upon the shore, and to see ships tossed upon the sea: a pleasure to stand in the window of a castle, and to see a battle, and the adventures of it below: but no pleasure is comparable to the standing upon the vantage ground of Truth, and to see the errors, and wanderings, and mists, and tempests in the vale below: so always that this prospect be with pity, and not with swelling or pride. Certainly it is Heaven upon Earth, to have a man's mind move in Charity, rest in Providence, and turn upon the poles of Truth.'"

Obituary Notices.—During the past year the Club has had to lament the loss of two of its oldest members, Mr. George Wailes and Mr. R. B. Bowman.

Mr. Wailes, who was an original member of the Club, and its President, 1860, died about 31st Oct., 1882. He had been for a long time unable to attend to business or to follow the studies that had been the delight of his life. He devoted himself chiefly to Entomology and the growing of Orchids and Alpine plants. He formed a good collection of British Butterflies and Moths, and contributed a Catalogue of the local Lepidoptera to the Transactions of the Club. He possessed a good library of Works on his favourite subjects.

Mr. R. B. Bowman, whose death took place very suddenly in the Old Museum, Nov. 24th, 1882, had been a member of the Club from 1859, and, though taking no active part in its working, was an ardent sympathizer with all students in Natural History. He was early associated with the Messrs. Hancock, Hutton, Hewitson, Alder, Burnett, and Wailes in their Natural History pursuits, devoting himself chiefly to Botany, and occupied a distinguished position among its leading investigators, and became an authority whose opinion was always of weight. He was a genial kindly man, and ever ready to impart his knowledge to earnest students.—*J. W.*

The following gentlemen were elected members of the Tyneside Naturalists' Field Club during the year 1882:—

At the Anniversary Meeting, May 11th, 1882:—Rev. Thos. Stephens, Monkwearmouth; Messrs. Jonah Johnston, Cloth Market, Newcastle; John Robson, jun., 22, Washington Terrace, James Edw. Smith, Saville Street, North Shields; Dr. Robt. Huntley, Jarrow-on-Tyne.

At Blanchland, May 29th:—Messrs. James Kidd, Oxford Street, Thomas Emley, 7, Ellison Place, Newcastle; Joshua S. Wilson, Thornlea, Thomas Edwin Pumphrey, Mowbray Villas, Bishopwearmouth; James Pybus, 18, Marine Terrace, North Shields; Thos. W. Barron, M.B., 16, Old Elvet, Durham.

At High Force, Teesdale, 28th June:—Messrs. Joseph H. Morton, 1, Ravensbourne Terrace, Adam Hope, Westoe, South Shields; C. F. Gomoszynski, 41, Linskill Terrace, North Shields; R. S. Thorpe, Devonshire Terrace, Newcastle.

At Cullercoats, October 6th:—Sir Chas. Trevelyan, Wallington Hall, Cambo; Mr. Ant. Duncan Cairns, Tynemouth.

The Field Meetings for 1883 were arranged to be held as follows:—

May 28th	Talkin Tarn and Gelt.
June 27th—29th (Race Week)	Settle and Craven District.
July 16th	Sewing Shields and Roman Wall.
August 6th	Barnard Castle and Balderdale.
September 10th, 11th	Otterburn and Neighbourhood.
October 5th	Morpeth.

THE TREASURER IN ACCOUNT WITH THE TYNESIDE NATURALISTS' FIELD CLUB.

FROM JANUARY 1ST TO DECEMBER 31ST, 1882.

Dr.

1882.		£	s.	d.
Jan.	To Balance brought forward	95	1	3
	,, Subscriptions	106	15	0
	,, Sale of Transactions	3	18	4
		£205	14	7

Cr.

1882.		£	s.	d.
Dec.	By Journal, printing and issuing Circulars to Members	26	6	2
	,, Secretaries' Expenses and Disbursements	15	9	1
	,, Postage and petty expenses	2	5	10
	,, Commission for collecting Subscriptions.....	5	16	9
	,, Printing	1	14	0
	,, Balance	154	2	9
		£205	14	7

Examined and found correct,

T. P. BARKAS.

The following gentlemen were elected officers of the Club for the year 1883–84 :—

President.

A. S. Stevenson, Esq., Tynemouth.

Vice-Presidents.

John Hancock, Esq.
John F. Spence, Esq.
D. O. Drewett, Esq.
John Philipson, Esq.

Ralph Carr Ellison, Esq.
Rev. J. F. Bigge, M.A.
D. Embleton, Esq., M.D.
Rev. Canon Tristram, F.R.S.
Rev. A. M. Norman, M.A.
Rev. J. C. Bruce, LL.D.
Rev. A. Bethune, M.A.
E. J. J. Browell, Esq.
Rev. R. F. Wheeler, M.A.
Prof. G. S. Brady, M.D.
H. B. Brady, Esq., F.R.S.
Rev. J. E. Leefe, M.A.
Rev. G. R. Hall, M.A., F.S.A.
G. H. Philipson, Esq., M.D.
Rev. R. E. Hooppell, LL.D.

Treasurer.

Robert Y. Green.

Honorary Secretaries.

Richard Howse.
Thomas Thompson.

Committee.

Henry C. Abbs.
T. W. Backhouse.
Joseph Blacklock.
James Clephan.
T. T. Clarke.
William Dinning.
John Glover.
Rev. J. M. Hick.
William Maling.
Edward C. Robson.
John T. Thompson.
Jno. R. Young.

Auditors.

J. S. Forster.
T. P. Barkas.

XII.—*Miscellanea.*

Note on the habit of the young Cuckoo in ejecting the eggs and young of its foster-parent from the nest.—For many years I have been very desirous of observing the habit of the young Cuckoo at the time when it was just hatched, and when it was busy in ejecting the eggs and young of its foster-parent from the nest. During my stay at Oatlands in the summer of last year (1884) I am glad to say that a favourable and satisfactory opportunity occurred of making this observation.

I began in June to search the grounds carefully for as many nests as I could find, that were likely to have Cuckoos' eggs in them, and was fortunate enough to find one in a spot convenient for making continued observations, on the 17th day of June, 1884. The Cuckoo's egg was in the nest of a Hedge Accentor, containing four of its own eggs, and built in a Bramble bush, near the bottom of the sloping terrace at Oatlands. I tried the Cuckoo's egg and one of the Hedge Accentor's in water, to ascertain if they were fresh or sitting. The former floated, denoting that it was sitting; the latter sinking to the bottom, was of course fresh.

On the 25th of June I examined the nest. No change had taken place. There were still the one Cuckoo's egg in the nest and the four Accentor's.

On Friday, the 27th June, I looked at the nest at three o'clock in the afternoon, and the Cuckoo's egg was hatched, and one of the Accentors. At twenty-five minutes to six o'clock I looked at the nest again, and another Accentor's egg was hatched.

On Saturday morning, 28th June, I rose early, and went to the nest at twenty minutes to four o'clock A.M. All was quiet, and the old bird on the nest. At two minutes past five o'clock saw into the nest. There were just the young Cuckoo, the two young Accentors, and the two eggs. A few minutes after five o'clock the young Cuckoo attempted to put an egg out of the nest, by getting it on to its back in the most clumsy manner; but it did not succeed in getting the egg high enough to roll it

over the edge of the nest. Immediately after this proceeding the old Hedge Accentor came on to the edge of the nest, and stooped down with its head into the nest, and took some white matter into its mouth (I think excrement from the young birds) and swallowed it. The old bird went on to the nest and off again four or five times in about two hours. I left for breakfast at eight o'clock, the old bird sitting on the nest. Returned at half-past eight. The old bird was off the nest, and the young and eggs as before lying quiet at the bottom of the nest. I don't think the young birds have been fed yet. The old bird has returned and is sitting on the nest. I feel sure that the old bird takes the dung from the young birds and eats it. The old bird remained off about ten minutes at a time. She is back and on the nest again this time in a minute or two. She appeared to be very uneasy and uncomfortable, raising her wings and standing on her legs in the nest. In this position she made a kind of shuffle, and in a moment the Cuckoo was on the back of the Hedge Accentor, and in another moment the Accentor was off the nest and the Cuckoo into the nest off her back: what this meant it is impossible to say. The mother was off for about ten minutes, and then on again and off, and when off an Accentor's egg was put on to the edge of the nest by the young Cuckoo in my presence. This was at half-past ten. The egg rested on the edge of the nest for some time, and then it fell down into the bush, by the movements of the old bird on the edge of the nest. The Cuckoo then fell into the bottom of the nest, apparently in a very agitated state and overpowered or exhausted by the effort. The mother then returned again to the nest, and proceeded as before in taking off the dung from the young and eating it. She remained a very short time on the nest, but seemed very uneasy, raising herself and standing in the nest. The Cuckoo seems to be increasing in bulk, and is much agitated, lying at the bottom of the nest. The two young Accentors lay motionless at the bottom of the nest, whilst the Cuckoo kept moving its wings like hands as if to excite or stir its companions into action. In about twenty-five minutes the Cuckoo made two desperate efforts to get one of the young Accentors flung over

the edge of the nest, but failed, for when it got the young one to the top it fell back again into the bottom of the nest. Another unsuccessful struggle took place when the mother was on the side of the nest. About eleven o'clock the first young Accentor was put over the edge of the nest, exactly as illustrated by Mrs. Blackburn.* The mother was present, but took no notice of the affair going on, but looked on calmly. The second egg was pushed out at one P.M., in the presence of myself, Miss Abbs, and my sister, whom I had specially invited to come and see the proceedings of the young Cuckoo. The last and fourth of the lot we left in the hands of the destroyer. It was sitting almost on the back of the Cuckoo, which had had one try to put it over the edge of the nest, but had failed. At 3.30, when we returned to examine the nest, the young Cuckoo was the sole occupant.

The first baby Accentor which had been thrown on to the edge of the nest was still alive, so we put it into a Whitethroat's nest, which had four young ones about a day old, and from all appearances it will be properly attended to by its foster-parents.

The Cuckoo's proceeding, as I saw it, is, in my opinion, the most wonderful and unaccountable piece of business that I ever witnessed in bird-life.

On Saturday, July 5th, I looked into the nest, and to my astonishment the young Cuckoo lay motionless at the bottom of the nest, and I found that it was dead. In all probability it had died from the heat of the sun, for a day or two before, when looked at, the Cuckoo was panting, evidently affected by the heat; in fact we had shaded it, by placing some Bracken leaves to screen it from the sun, but by some means the leaves had been removed, and the sun's rays fell direct on the young Cuckoo.

To summarize this account, I may state that the eggs of the Cuckoo and four eggs of the Accentor were found in the nest of the Accentor on the 17th June. On Friday, June 27th, the Cuckoo's egg and two eggs of the Accentor were hatched. On Saturday, June 28th, one attempt to put out Accentor's egg did not succeed. At 10.30 A.M. first egg was put out of nest. About

* See "The Pipits," illustrated by I. H. B., Plate XI. 1872.

11 A.M. the first young Accentor was pushed out. At 1 P.M. the second egg was pushed out in the presence of three witnesses. The last of the lot, the second young Accentor, was removed between 1 and 3 o'clock P.M., during the time I was away or absent.

These observations, though they may seem to be a repetition of the accounts given by Dr. Jenner, Montagu, Mrs. Blackburn, and other accurate observers, are nevertheless necessary in these days, for in the minds of some ornithologists it seems to be still an undecided question, How the young Cuckoo gets the young of its foster-parents from the nest? I have before had an opportunity of ascertaining the fact, and expressing my full belief in the accounts given by Dr. Jenner, Col. Montagu, and others, as stated in my Catalogue, p. 26, but till last summer I had not had a successful opportunity of watching the whole process so carefully as I was able to do on that occasion.

Since these observations were made my attention has been directed to the following quotation from Mr. Henry Seebohm's "History of British Birds," Vol. II., p. 383:—

"It has been said, on what appears to be incontestable evidence, that the young Cuckoo, soon after it is hatched, ejects the young or eggs from the nest by hoisting them on its back; *but one feels inclined to class these narratives with the equally well-authenticated stories of ghosts and other apparitions which abound.*"

The facts observed with much care, and minutely narrated in this note, support the "incontestable evidence" given by Dr. Jenner, Montagu, and Mrs. Blackburn, so fully and conclusively, that I am at a loss to understand how any one who has not personally investigated and observed this habit of the young Cuckoo, could allow himself to express so strong an opinion as Mr. Seebohm has done in the Italicised portion of the above quotation.

There are still many points in the life-history of this interesting summer visitor which require to be worked out accurately. There are many questions regarding it which no ornithologist is able to answer satisfactorily, as for instance:

Is it the male or female Cuckoo that produces or utters the well-known familiar note, or both?

Most of the Passeres moult before migrating. Does the young Cuckoo moult before migrating? or does it moult in its winter quarters?

How does the old Cuckoo come to the knowledge of the time when it must place the egg in the nest it selects for that purpose? For if the Cuckoo's egg should not hatch for a few days after the others, the young Cuckoo would be too feeble to perform the operation of lifting the young of its foster-parents over the edge of the nest.

In concluding these observations, I cannot help pointing out that the recent provisions of the Bird Acts prevent, at present, in England, any further investigations on these and other important points in Bird-life, which require to be made during the breeding season, in order to complete our knowledge and perfect the history of our British Bird-Fauna.—*Observed by John Hancock, at Oatlands, Surrey, in June*, 1884, *and read Nov.* 26*th*, 1885.

Note on the Indian form of the Spotted Eagle (*Aquila nœvia, Briss.*) *shot on the Northumberland Coast, near Cresswell, October* 31*st*, 1885.—A few days ago I had the pleasure of examining, through the kindness of Mr. Robt. Duncan, a fine specimen of this interesting bird, which has not before been recorded as occurring on the Northumberland coast or in our district. It is a bird of the year, in very fine unworn plumage, and undoubtedly the same as the Indian form, of which I have examined many specimens. The length of this example, from the end of bill to end of tail, was 28 inches. The extent of wings, 67 inches. Eye hazel.—*John Hancock.*

Lichen Memorabilia, 1884.—A day spent in the neighbourhood of Morpeth, Northumberland, in the early part of last year, although none of the brightest so far as the weather went, is now a pleasant recollection. The spring had come but not the leaves or the fresh grass, yet it was easy to feel all about one that these were coming, for the whole earth seemed slowly awaking out of a sleep, and quietly swelling out her fulness of reviving life in embryo and bud. The old irregular town of Morpeth is

situated in a wooded hollow, on the banks of the Wansbeck, about seven miles from its estuary; and it still retains, amid the hurry and change of modern times, some aspect of old English gentility. From Morpeth the ground rises north-west, through a sparsely populated district, where the furze, the honeysuckle, and wild rose still haunt the lanes and hedgerows, until the Cheviots loom into view, a promising region for the lichenologist when it may be searched. On the day referred to, we had to content ourselves with a ramble between Mitford and Morpeth, and the following list comprises the lichens we gathered. It is only fair to say, that our day was not the most favourable. The ground was damp and slippery on the banks, consequently our search was neither very close nor protracted. The smoke from the Tyne and the Northumberland coal-field seems to have somewhat affected the lichenoid growth of this locality, which it will eventually obliterate. Already the deleterious atmosphere from the Tyneside has utterly destroyed species of Ramalina, which flourished in fruitfulness, on the trees about Gibside, in the days of Mr. Winch. For verification of this, *vide* Science Gossip, Vol. XV., p. 217.

Callema cheileum, Ach. On the ground and walls.

Cladonia pyxidata, var. *chlorophæa*, Flk. On the ground, Borough Wood.

Cladonia macilenta, forma *clavata*, Ach. On fir trees.

Evernia prunastri, L. On trees, barren.

Ramalina farinacea, L. On trees.

,, *fraxinea*, var. *tæniæformis*, Ach. On trees, dwarfed, but in fruit.

Parmelia physodes, var. *recurva*, Leight, and var. *platyphylla*, Ach. Both on trees.

Parmelia saxatilis, var. *sulcata*, Tayl. On trees, Mitford, in fruit.

Physcia parietina, L. Type on trees; var. *aureola*, Ach., on walls; var. *lychnea*, Ach., on wooden gates or palings.

Physcia pulverulenta, forma *pityrea*, Ach. On trees, barren; forma *venusta*, Ach., on trees, in fruit.

Physcia obscura, var. *virella*, Ach. On palings, in fruit.

Physcia ciliaris, forma *verrucosa*, Ach. On trees, dwarfed and barren.

Physcia stellaris, L. On trees, in fine condition; var. *tenella*, Scop., limited and poor, on palings.

Lecanora lutescens, DC. On old bark.

,, *subfusca*, forma *rugosa*, Pers. On trees; forma *argenta*, Ach., on trees; forma *chlorona*, Ach., on palings.

Lecanora poriniformis, Nyl. On rocks and stones.

,, *pyracea*, Ach., on palings.

,, *atra*, Huds., forma *grumosa*, Pers. On rocks and stones.

Pertusaria communis, DC. On trees.

,, *faginea*, L. On trees.

Lecidea lapicida, Fr. On stones.

,, *contigna*, Fr. On rocks and stones.

,, *canescens*, Dicks. On trees, barren.

,, *rubella*, Ehrh. On trees.

,, *cancentrica*, Dav., forma *impressula*, Leight. On walls.

Opegrapha varia, Pers., forma *tigrina*, Ach. On trees.

Graphis scripta, Ach., forma *tremulans*, Leight. On trees.

,, *sophistica*, Nyl., forma *flexuosa*, Leight. On trees; forma *divaricata*, Leight, on trees; also forma *diffusa*, Leight.—*Rev. W. Johnson.*

Note on the Birds seen at Nest House, Felling Shore, in May and June, 1884.—The Sparrow, abundant; the Hedge Sparrow; the Chaffinch; the Yellow Hammer; the Black-and-white Wagtail.

No Thrushes or Blackbirds were visible, as owing to alkali and other fumes there is not a green tree left in the neighbourhood.

Starlings were in considerable numbers. Many build in the walls of the tank refuse heaps from the alkali works opposite the house front.

Cuckoos have been so familiar as to come quite near to the front windows, where they could easily be observed picking up and feeding on hairy Caterpillars.

The Kittiwake, the Lesser Black-backed Gull, the Black-headed and other Gulls, on the river.

The Wheatear.—Several were seen about the garden and out-houses for weeks together. One pair built a nest and reared their young. The nest was found, after some search, in an irregular heap of lumps of slag, brick, and sandstone, at the end of a long irregular passage, the entrance to which was on the south side of the heap, and the nest near the north side, situated directly under a flat stone. The nest was large for the size of the bird, and composed of small twigs and straws, and lined with feathers of the common fowl. The heap of stones lay in a bit of waste ground outside the garden wall, and not far from the stack-yard and the poultry. The nest contained an addled egg, of a very pale blue, sparsely scattered with small brown spots, chiefly at the big end. The young, four or five in number, had flown a day or two before the nest was taken. The nest and egg were presented to the new Museum by Mr. Robson, Miss Easton's coachman. Another nest of the Wheatear, as I was informed, was found about the same time on the Town Moor by Mr. John Hancock, placed also under a flat stone.—*D. Embleton, M.D.*

Note on the occurrence of Shrimps in the Tyne.—Considerable quantities of Shrimps are dredged from the river just below Dent's Hole, both on the north and south sides, and are sent up to Newcastle for sale during the greater part of the year. On March 12th, 1884, some were got for me from Emmett, the fisherman, opposite to Nest House. They were all of moderate size; six of the best weighed half an ounce. They must live one half of their time in fresh and the other half in salt water. I have seen them dredged for by men in a boat between the High Level Bridge and the Skinner's Burn, on the south side of the river, where there is sand; and they have been caught as far up the Tyne as Dunston Steamboat Landing; indeed, I am informed that they have been taken a good deal farther up the river, and in large numbers, at Blaydon, which is four miles above Tyne Bridge and about thirteen miles from the sea.—*D. Embleton, M.D.*

Note on the capture of Tunnies and of a fine specimen of the "Bergylt," or Norwegian Haddock, off the Tyne, June, 1884.—A small shoal of Tunny (*Thynnus thynnus*) was caught off the Tyne a day or two ago. Three specimens, each about three feet long, were exhibited in Brown's, the fishmonger's, shop. The same day a specimen was seen, at the same place, and which had also been caught a few miles off the mouth of the Tyne, of the Bergylt, *Perca marina*, Lin., *Sebastes Norvegicus*, Yarrell and Gunther, *Scorpæna Norvegica*, Jenyns. It was of a bright scarlet colour all over; head and eyes very large, the latter projecting from the orbits, which measured one inch and five-eighths at the widest part, which was nearly vertical. Length of body, twenty-two inches and a half; greatest depth across the attached part of the pectorals, five inches and a quarter. Five strong short spines project backwards from anterior operculum. The mandible extended in front half an inch beyond the maxilla; on the under side of symphysis of mandible was a short, hard, bony process, pointing forwards and downwards. Fin rays: dorsal, fifteen spiny, fifteen soft; pectoral, seventeen spiny, eighteen soft; ventrals, one spiny, five soft; anal, three spiny, eight soft; caudal, fifteen. These numbers differ only slightly from those of Couch.*—*D. Embleton, M.D.*

Note on the visit of a Shoal of Tunny to the Northumberland Coast in June, 1884.—On the 17th June, last year, Mr. Henry Clarke wrote to me about a fish unknown to the fishermen that had been caught during the night, in the Salmon nets, two miles off the Tyne. He sent me also a pen and ink sketch of the fish, by means of which it was easy to make out that it was a small specimen of the Common Tunny, a novel visitor apparently to the East coast of this island. Afterwards Mr. Clarke kindly ascertained that about thirty had been caught; five of which were landed at Shields, five at Cullercoats, and twenty were thrown overboard, as they were considered by the fishermen worthless. The specimens seen by Mr. Clarke were about three feet two

* This specimen was obtained by Dr. Embleton and after being preserved was kindly presented to the Nat. Hist. Soc. Museum.—Ed.

inches long, and twenty-four inches in greatest girth behind the pectoral fins, and weighing about twenty-seven pounds. Mr. Clarke's outline drawing will give some idea of the shape of the fish, which he very rightly judged to be related to the Mackerel. The body was dark bluish gray above, and silvery white beneath and on the sides when fresh, and no scales were visible; but the scales on the belly and sides show themselves when the skin becomes quite dry. Teeth very small for the size of the fish. Mr. John F. Spence ascertained for me that many of these Tunnies had been caught by several fishermen in the Salmon nets during Monday night (16th June). One fisherman brought in twenty-five and another ten. They were sold at North Shields Fish Quay at sixpence each, and were afterwards retailed in the shops at sixpence per pound. On Wednesday, 18th June, I went down to Blackett Street, and saw several of these Tunnies in Mr. Brown's shops. They were about three feet long, and were retailed at sixpence per pound. The flesh was red like beef, and not unpalatable. These Tunnies were caught by the Tyne fishermen on the Monday night only, and though a sharp look-out was kept none were caught after that time in 1884. The fishermen started a theory that they had followed a ship from Norway, whose keel was covered with Barnacles, etc.; but it is more probable that their visit was accidental, as we can find no record of Tunnies having been captured on this coast before, but when once on our coast they would have no difficulty in obtaining food, as they feed on Pilchard or Herring.

Donovan mentions that three were caught in the summer of 1801 near the entrance of the Thames, and brought to Billingsgate Market, but before that time had been taken only in the north of the island. He says "the flesh is tolerable; when raw it looks like beef, but becomes of much paler hue in boiling. Its flavour is between that of Salmon and Mackerel, though certainly inferior to either." The usual length of the species is two to three feet, those of six or seven feet are not common, and it rarely exceeds ten feet.

Dr. Fleming states that the Tunny is rare in England, but frequent on the west coast of Scotland.—*Richard Howse.*

Note on the capture of a very large Tunny in the Salmon Nets, off Frenchman's Bay, near the mouth of the Tyne in August, 1885.—On Monday, August 24th, the Salmon fishermen in the employ of Mr. W. Clift, of South Shields, while prosecuting their usual occupation enclosed a very large fish in their Salmon nets, off Frenchman's Bay, between the mouth of the Tyne and Marsden Bay. I am told that not being able to kill the fish or lift it on board their boat, they sent ashore for a gun and fired two or three charges of shot into its head and body, and after killing it in this way they towed it in the nets to the Tyne, where it was landed, and afterwards taken in a cart to Mr. Clift's shop, where it was exhibited for a week. I have not had an opportunity of obtaining a full report from the fishermen themselves, but it had certainly been shot at close quarters, for some of the pellets are still visible buried under the skin, and others were seen in the bones of the head.

I went to Shields to see this fish on the Thursday, and took the following measurements:—Extreme length, nine feet; girth, about five feet six inches. Front dorsal, about ten inches high in front, and gradually lessening in height to one inch and a half, and armed with about fourteen strong spines, the whole folding into a groove along the top of the back. The second falcate dorsal fin, very hard and stiff, about sixteen inches in length. Pectorals, about sixteen inches; five inches wide at base, stiff and hard, and could be folded close to the side. Lobes of tail, seventeen inches each; the distance between distal extremities, twenty-eight inches. Ventral fins, about ten inches; the falcate anal, eleven inches. Eye, two inches and a quarter by one inch and three-quarters, of irregular and peculiar shape, and about twelve inches from snout. Mouth not large, with mandibles projecting upwards and rather beyond the snout. Teeth rather small and regular in size, not prominent, and curved inwards No laniary teeth. Scales large above the pectorals and along the back, but smaller on the sides and belly, and not visible when the fish is fresh, being covered with skin. Opercular plates large and wrinkled longitudinally. When quite fresh the upper parts were of a dark bluish-grey colour, afterwards

turning very dark, with reddish patches of colour shining from beneath; the sides and belly silvery, shewing prismatic colouring when fresh like the Mackerel. There are nine finlets between the last dorsal and the tail, and eight between the anal and caudal fins. These were of pale lemon colour when first seen. There is an expanded ridge on each side of the body near the tail.

Through the liberality of Mr. Clift the specimen was presented to the Nat. Hist. Soc., and will, when the preservation of it is finished, be exhibited in the fish collection of the Museum.

From a statement in the preceding note it will be inferred that this individual is one of the largest captured in recent times. There appear at least to be no records of such a large Tunny having been caught in the North Sea before.

As the Tunny is an oceanic fish, ranging from the coasts of the British Isles to Tasmania, the surprise is that it has not before (that I am aware) been recorded as a visitor to this coast. The three mentioned by Donovan as having been captured in the estuary of the Thames being the only mention that can be referred to at present.

Since the above was written I find it stated, on the authority of Mr. Paget, that small specimens are not unfrequently caught during the Mackerel (? Herring) fishing at Yarmouth.

It is, says Dr. Gunther, one of the largest fishes of the ocean, and attains to a length of ten feet and a weight of one thousand pounds, and thus estimating the weight of the present specimen by this rule it must have been, as conjectured by the fishermen, between six or seven hundred pounds. Pennant states that a fish measuring seven feet ten inches weighed four hundred and sixty pounds.

The Tunny resorts to the Mediterranean and the Black Sea to spawn in the months of September and October, entering through the Straits of Gibraltar about that time. On the coasts of the Mediterranean, as is well known, the fishing for Tunny is carried on systematically, and has been prosecuted from the remotest antiquity. Its flesh is extensively eaten on the coasts it frequents, either fresh or salted or dried. Its salted preparation was esteemed by the Romans, under the name of *Saltamentum Sardicum*.—*Richard Howse*.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ BY THE PRESIDENT, ALEXANDER S. STEVENSON, ESQ., AT THE THIRTY-EIGHTH ANNIVERSARY MEETING, HELD IN THE LECTURE ROOM OF THE LITERARY AND PHILOSOPHICAL SOCIETY, NEWCASTLE-UPON-TYNE, ON FRIDAY, MAY 23RD, 1884.

LADIES AND GENTLEMEN,—I desire to thank you for the high honour you conferred upon me at the last annual meeting of this Club. I know well how small my claim is to sit in the chair of the President of the Tyneside Naturalists' Field Club. It was proposed to me a few years ago, and I declined the honour, because I shrank from its responsibilities. And now that I have accepted it, I am bound to say that I owe the position, not to any scientific qualifications of my own, entitling me to hold high office in the Club, but to the pressure kindly put upon me by some of my old friends amongst the members, and to your kind indulgence.

During the past year six Field Meetings have been held by the Club. In addition to these two Evening Meetings took place in connection with the Natural History Society of Northumberland and Durham. Of these meetings, and especially of the Field Meetings, it now becomes my duty to endeavour to give you some account.

The FIRST FIELD MEETING was held on the 28th of May, at Talkin Tarn, and down by that portion of the Gelt which lies below the railway or Middle Gelt bridge and the Low Gelt bridge. Here the river leaves its rocky boundary, and winding through a flat country for about two miles it falls into the Irthing, near its junction with the Eden. Fourteen members started by the early train, and breakfasted at the Beck Brow Inn near Brampton. Afterwards they took the shortest cut to Talkin Tarn, a small and pleasantly-situated piece of water, accumulated in a basin or hollow, and nearly surrounded, on one side, by the peculiar rounded mounds or hills of drift-gravel, and to the

south-east by the lofty fells of Talkin. It is shut in from distant view by hills and extensive plantations. The physical features of the district are very striking. The numerous rounded and elongated mounds here seen are composed of the alluvial drift, which to a great thickness covers the bright red sandstone rock underlying the district. And this sandstone is only exposed where the Gelt and other streams have cut deeply below the general surface. The Tarn is situated a little to the west of the enormous Pennine fault, and the only view from it extends to the mountain limestone fells of Tindle and Castle Carrock. Pelting showers deterred some of the party from climbing Castle Carrock Fell, which lay so temptingly near.

The time spent in waiting for the second party from Newcastle was employed in the examination of the woods and the margin of the lake; and the boats and boating accommodation and the Swans became objects of interest. The Blaeberry was plentiful, and in full flower. The Little Whin and several heath plants were gathered, and the Crab trees in all the hedge rows covered with their pink flowers made a splendid show of bloom. The second party, kindly guided by the Rev. Mr. Whitehead and Dr. Thompson, and coming by a short route, joined at the north end of the Tarn; but much time was spent under the shelter of trees, hedges, and umbrellas before starting for the Gelt. On the road and on the margin of the lake boulders of Criffel granite were observed, much larger than any occurring near Gilsland or in the valleys running into the Tyne further to the east, thus showing that much of the later drift of this latitude has been brought from the north and west, and extended eastward to the watershed of the Tyne. We entered the beautiful ravine of the Gelt near the railway bridge, and with much interest observed the deep cutting through both the drift above and the sandstone underlying it.

Rev. Mr. Whitehead addressed us on the history and traditions of the neighbourhood, and Dr. Thompson took some photographs of the party. A comfortable little Inn, hidden away in the ravine, where a turnpike road crossed it, afforded us some welcome refreshment. In this sheltered spot the trees were in full leaf,

and the Spring flowers bloomed in profusion. Passing along, halts were made to admire the vegetation, and the bold sandstone cliffs and the quarries, old and new. No traces of fossils could be found in those barren red beds, so there was nothing to show whether in this part of the Gelt they are Permian or Triassic.

Arrived at the Written Rock a longer halt was made. Some of the more adventurous climbed it and tried to decipher its old letters, the handiwork of Imperial Rome, and which the ivy, the moss, and the lichen have all but defaced. The more prudent of the party stayed below, content to take Dr. Bruce's word about them.

Near the Low Gelt bridge the stream escapes from its rocky barriers, and wanders through fields and green pastures. Passing along its banks, we saw a remarkable row of pot holes. They had been worn in the red sandstone by strong jets of water falling over a ledge, and twirling round large stones and gravel by the force with which they fell.

The road from Low Gelt to Brampton was in strong contrast to what we had just left. It runs straight through a nearly level country. It is bordered by well-trimmed hedges, and only now and then you catch a view to the level lands of North Cumberland, right away to the Scottish border and the hills beyond Solway. We had a ramble through the streets of the quaint small market town alive with noisy children, while Swifts, Swallows, and Martins circled in the air above us. The Church was visited, and afterwards about twenty-four members sat down to a comfortable meal at the Howard Arms, and thus ended a most pleasant visit to this part of Cumberland.

The Second Field Meeting was held at Settle, for the Craven district. It commenced on Tuesday, the 26th of June. About a dozen members left the Central Station by the mid-day train, first to Darlington, and then by Kirkby Stephen, along the upper valleys of the Eden and the Ribble. The change of scene and surroundings brought about by the short railway journey was very remarkable. Newcastle looked miserable when we left

it. It was the first day of the Races, and hanging about the streets and the station were crowds of the lowest class of betting men, and the poor specimens of humanity who emerge on such occasions, who, made in God's image, have through vice and drink fallen from that high position. Under a drizzling rain wretched little barefooted children were calling out "Correct cards of the Races" through the dirty streets. What a gulf there seemed to be between such scenes and those into which we were ushered when, within a few hours, we stood, out in the pure air, beneath the escarpments of the Pennine range. The sky was a clear pale silver, touched with green. Huge masses of dark clouds were passing over it, rolling down upon the moorlands from the east. Right before us, as we stood at Kirkby Stephen, was the Hill of the Seven Standards, with the seven strange monoliths which give it its name clearly defined against its lofty and silvery skyline. One great mass of cloud especially attracted our attention. It passed rapidly over our heads, and against this hill top it charged like a living thing, bursting over it, and hiding it from view. Altogether the scene was of fascinating sublimity. Our position however was not without drawbacks, for with one of those rolling masses of cloud we were destined to make a closer acquaintance. It suddenly broke over and around us in a deluge of rain, driving us to the nearest shelter, and thoroughly drenching us.

During our detention at Kirkby Stephen some of our party made an examination of the series of small pot holes worked out in the peculiar conglomerate which forms the bed of the Eden. Leaving Kirkby Stephen we passed through the weird moorlands, the source and watershed whence the Eden, the Ure, and the Ribble take their rise. As we rattled along through tunnels and cuttings we caught glimpses of those huge mounds of carboniferous limestone forming the mountain masses of Whernside, Ingleborough, and Penyghent, and of the vast sections of vertical Silurian slate which form the basement rock of the Craven district.

At Settle we found a comfortable home for a few days in the pleasantly-situated Ashfield Hotel. Early next morning we

started for Victoria Cave, the first part of the ascent to which involved a steep climb over rough roads till we reached a moorland rougher and steeper still. There a heavy shower drove us for shelter to a lonely farm outhouse, where we were glad to rest. For a mile, just in front of us, there extended a high range of grey cliffs, probably in glacial times old sea cliffs. The entrance to the cave, which was in the cliffs, was over a high wall; then we had to climb at an angle of about 45° a steep bank of rubble, made slippery by the recent rain. Any one accustomed to the sea coast caves of Durham might conclude that the noted Victoria Cave before us was an old sea cave; but this notion being heretical must be advocated with caution. The favourite theory is that it existed before the Ice period set in, and was the abode of all sorts of Carnivora. This opinion seems to be based on a peculiar view of ancient glacial history. That it was for long the cavern-home of our unfortunate Romano-British ancestors cannot be doubted, and this fact alone must ever give an intense interest to the spot. We were prevented by want of proper appliances from penetrating far into the cave. We peered into its recesses as far as we could, but discovered nothing, and learned nothing that could add to our Club's achievements. Mr. Howse, our indefatigable Secretary, ever-mindful of what the old logicians would have called the "*terminus ad quem*" of our visit, lingered long and searched carefully over the mass of debris thrown out from the cave, but no bone of "*Homo sapiens*," not even a piéce of flint or brass, rewarded his labours. We retreated ignominiously from the cave, and wandered over the bare and weather-worn limestone rock to conveyances which waited on us below. Driving to Malham Tarn we had fine views of the noble Penyghent and other famed hills of the district. The tarn lies on one side of a great peat bog accumulated in a hollow of the limestone. It is open to the south. On the north it is guarded by the lofty mountain fells. Heavy rain prevented us from examining the spot where the water of the tarn disappears in the fissured limestone, only appearing again, after a subterranean run of more than a mile, at the base of Malham Cove. There it issues from a wide cavity as a powerful stream, the

source of the Yorkshire river Aire. To those who know High Cup Nick in the Pennine range Malham Cove is perhaps disappointing, but still it is a very noble piece of rock, all the more so from being formed of one enormous bed of limestone. From Malham we started for Gordale Scar, on the line of the Craven fault. Here were high precipitous cliffs, and through one beetling cleft of which there came a wild tempestuous stream, sparkling and pure and limpid it rushed on to join the Aire. Like many a wanderer from a purer home it was hurrying on to be dyed by the pollutions of Leeds and other towns, but perhaps again to be purified in the great eternal ocean, which lay far in the distance.

The drive home was through Kirkby Malham, then over a long heather-covered fell. During this drive a thick mist hid the landscape from our view. As we passed over the lofty escarpment of the Craven fault this became a heavy downpour of rain, seemingly enjoyed by the good people of Settle, who wanted it, but by no means pleasant for us.

Next morning we drove to Clapham, to visit the Ingleborough Caves and the Gaping Gill Pot Hole. Our route took us across the Ribble, a fine stream at this point, and by the Ebbing Well, and by the base of the long elevated escarpment which seems to indicate and follow the line of the great Craven fault.

The previous night's rain had flooded the Ebbing Well, so our curiosity as to its working was not gratified. We passed on under the bold grey cliffs, looking so like an ancient sea coast, for strangely enough Time has not rounded off the sharpness of its angular summits nor covered its face with debris. It doubtless contains caverns full of interest, hidden by dense underwood.

After our arrival at Clapham a start was made for the celebrated cave, and Mr. Farrer's agent allowed us to take a short cut to it through that gentleman's grounds. Some detention occurred at the mouth of the cave, the guide being at the far end of it with a large party. At length the iron gates were unlocked, and after being provided with candles fixed in sticks we proceeded to see the wonderful and varied stalactite and stalagmite figures formed in the cave. I need not enter into details as to

these, as an interesting account of the cave, read at the Culler-coats meeting, by Mr. T. T. Clarke, will shortly be published in the Transactions.

Leaving the cave our party divided, one section returning homewards, the other, intent on seeing the Gaping Gill Pot Hole, extended their journey in search of it. The track to it lay by Trow Gill to the moorland, and we followed it in a driving mist rolling down from the Ingleborough heights. We found nothing to indicate the exact spot, and it was with difficulty that we at length discovered the unguarded and dangerous abyss. It resembles a pit shaft, and the opening, which appeared to be about twenty-five feet in diameter, lies in a cup-like hollow, by the sides of which we approached it with a feeling of awe. The depth is said to be about three hundred feet, and this we partially verified by timing the descent of stones we cast into it. A mountain stream, formed by the drainage of the east side of Ingleborough hill, falls into the cavity, and emerges into daylight after a subterraneous passage of nearly a mile, the latter part of which is through Ingleborough Cave, which we had just left.

The next day was wet, and some of the party returned to Newcastle. Others, however, were anxious to see the Museum at Giggleswick, in which are deposited many of the things of interest discovered in the Victoria Cave. Here were the remains of the elephant, rhinoceros, hippopotamus, bear, hyena, reindeer, and other animals. There are also articles of stone, brass, iron, bone, glass, silver, and lead.

We also visited the old Church, which is most interesting, and which it is to be hoped may be saved from the hands of that most ruthless iconoclast, the modern restorer.

The old stone houses of the district are of great interest, and show how their builders towered over the ordinary builders of this age in knowledge of proportion, that *first* element of architectural design.

The Third Meeting was held at Crag Lough and Sewing Shields, on Monday, the 16th of July. Half-a-dozen members

left by the early train, intending to walk from Bardon Mill, by Chesterholme, to Hotbank and House Steads, and before reaching Bardon Mill the party was considerably increased. There they had to wait an hour for breakfast; the good landlady of the Inn, perhaps doubtful of our Secretaries' note, had decided to see her guests before providing for them!

In the early days of the Club this district was much visited by the members, led by a local botanist, who was well acquainted with its antiquities as well as its plants. The locality being new to those present they kept as closely as possible to the burn-side till they arrived at Chesterholme, the *Vindolana* of its Roman founders. Here was a Camp situated on what may be called the low road, Stanegate, from Walwick Chesters to the west.

Attention was called to a remarkable milestone by a countryman, who expatiated on it and the other antiquities, but, like many local *ciceroni* of his kind, with an evident eye to the main chance. A long examination was made of the numerous Roman stones, now built into the walls of a modern residence, pleasantly situated for shelter in winter and coolness in summer, on just such a site as may have been a sanitarium in the old Roman days for the soldiers stationed along the Wall.

Some of the party here broke away, intent on exploring the Muckle Moss, once a favourite place for some rarer local plants, and which, in spite of constant attempts to drain it, is as treacherous a piece of bog as ever. Situated between, and almost surrounded by sandstone ridges, there is no visible outlet for the water which gathers in its hollow. Probably some of it percolates through the sandstone ridges, and through the lines of stratification to the south. Enough, however, remains to keep the accumulation of peat in an almost fluid state, and to accelerate the rank growth of Sphagnum, Ling, and other marsh-loving plants. The uncertainty of the footing near the edges gave scarcely a minute to gather some of the rarer plants, and, with all the drainage, many parts would not support the weight of a man. If this old and treacherous bog could be drained and excavated, what a fund of interest it might afford! Bones of unwary wanderers, Briton, Roman, and Saxon, may lie there; and

the remains of wild cattle, formerly existing, and long since extinct! The splendid flowers of the Spotted Orchis and several rare plants were found, but the one most desired, *Malaxis paludosa*, was not seen. A rougher and more disorderly road than the "Stanegate" is rarely found.

Those of the party left behind ascended the sloping ground to Hotbank, and examined the Camp at House Steads, meeting a contingent of members, who had left by a later train, and walked from Haydon Bridge to Sewing Shields, and onward to House Steads. This route has so often been traversed by the Club that no observations are necessary. The party dined at Haydon Bridge, and left for Newcastle by the late train, after having spent a pleasant day, interrupted by only one or two slight showers, and were thus more fortunate than those of the members who paid former visits to the locality.

The Fourth Meeting was held at Barnard Castle for Balderdale, on Monday, the 6th of August. About twenty members were present, half of them arriving at Barnard Castle on the Saturday evening, when a ramble was taken through the precincts of the town and by the banks of the Tees. The stream, for want of rain, was so small as to be fordable in many places; and the unpleasant odours exhaled from it, recalled to mind the fearful ravages of an epidemic which visited this favourite resort half a century ago.

The weather on Monday was unsettled, but only a short and rather refreshing shower fell during the enjoyable drive by Deepdale, Lartington, and Cotherstone, and along the narrow lanes to Hury Mill. At this place it is intended to form a dam across the valley, thus making a large reservoir for the supply of water to the towns on the lower reaches of the Tees. If this plan be carried out the pasturage, farmsteads, and trees would be covered, and of course destroyed, leaving only the heathery moorlands round the water.

The scenery in the upper part of the dale above Hury is less varied and romantic than is usual in the tributary valleys of the Tees. Mr. Howell, director of the Geological Survey of the

district, who fortunately was our guide, suggested that this may be due to the fact that the valley is cut out of beds of Millstone grit, which occupy the moorlands between the valleys of the Lune and the Greta. Very thick beds of dark shale are seen in some of the lateral becks, an unusual feature of the Millstone grit series.

The ascent of Shaklesborough, an isolated hill, nearly 1,500 feet high, was an attraction for the younger members. The others preferred to wander over heath and moss nearly to the watershed, and they lingered so long that a recall had to be made; and even a hasty drive back scarcely allowed the party to partake, before train time, of the dinner prepared for them.

Balderdale, especially in its upper portion, is perhaps the least interesting of the Teesdale lateral valleys. It may be that the proposed "reservoir" may chance to give some beauty and novelty to this Millstone grit region. It will at least tend to collect flocks of water birds, to enliven its cheerless aspect. In the early part of our drive there was no lack of richly-coloured autumnal wild flowers such as grow so luxuriant in these sub-alpine dales.

The Fifth Field Meeting was held at Otterburn, and took place on Monday and Tuesday, the 10th and 11th of September.* The principal object held out to the members was an examination of a so-called Quarry on the moor, in the sandstone slabs of which numerous fossil footsteps of some problematical animal were to be obtained. The trip on the whole was highly successful, but the footsteps we found not.

Fifteen members assembled, some of whom had gone out to Horsley on the Saturday evening, and had the pleasure of a walk by the Watling Street road to High Rochester, the *Bremenium* of the Romans, where they inspected the remains of that once strong and commanding station. The weather early on the Monday morning was very unpromising, and a heavy fall of rain caused several of the members to turn back at Morpeth (amongst

* For the account of it I am indebted to a valued member of the Club, Mr. T. T. Clarke.

others the projector of the trip, who thus left the other members to their own devices, unaided by the experience that previous visits had afforded him).

The first part of the day's proceedings was a visit to Otterburn Tower, the seat of the James family, a fine castellated building,

"Bosomed high in tufted trees,"

which we were kindly allowed by the proprietor to inspect. The northern corner of the modern tower includes part of the walls of the old castle beleagured by the Scots several days before the celebrated battle of Otterburn. Three very perfect Roman Altar Stones, said to have been brought from Rochester, are placed at the entrance to the tower.

A pleasant walk by the side of the little burn that gives its name to the place brought us out upon the moor, and with the aid of an intelligent guide we started for the Quarry, where we expected to find much to interest and instruct us. A good stretch of about three miles brought us to the scene of recent explorations, but nothing of interest was found to reward us for our long and weary walk, as every vestige of a fossil footstep had been removed. But fortunately there was in the company a member of the Club capable of redeeming the time lost. Mr. Thomas Arkle undertook to conduct us from the scene of our disappointment over the moor to the battlefield of Otterburn, where the headlong Hotspur fought and the doughty Douglas fell.

On the way we passed many spots marked with stones set in circles, indicating ancient places of burial, and saw the entrenched camp occupied by the Scots before the battle, which was taken and retaken more than once during the fray. We saw too the stone cross erected not far from the spot where the Douglas was slain. In the evening, after dinner, Mr. Arkle, who assisted Mr. Robt. White in the preparation of the maps illustrating his admirable "History of the Battle of Otterburn," read portions of a paper written by him on the subject. White says "there can be no doubt whatever that the ancient ballad of Chevy Chase was founded upon the battle of Otterburn." We read towards the close of the ballad—

"This was the hontynge of the Cheviat,
That tear began this spurne,
Old men that knowen the grownde well yenough
Call it the Battall of Otterburn.

"At Otterburn began this spurne
Upon a mornyn day,
Ther was the dougghte' Doglas slean,
The Perse never went away."

The second day was commenced by a drive to Elsdon; but, leaving the conveyances at Overacres, we struck across the moor to visit an ancient British camp on a hill to the north. The camp covers the entire crown of the hill, and the trench and mound form an unbroken circle. On the way towards Elsdon, we were most hospitably entertained by Mr. and Mrs. Horsley, of Chirton House, who happened to be then staying with their family at their beautiful little moorland residence of Ferney-cleugh. Continuing the walk, we reached the Rectory House at Elsdon, which, by the kind permission of the Rector, was open to our inspection. It is a strong old Border tower, with a circular stair at one corner. The lowest storey of the tower is spanned with a large arch, and has been converted into an elegant modern drawing-room. The walls are of immense thickness, as shown by the bay window carved out of the wall at one end of the room. On the front of the tower are the Umfranville Arms, with an inscription, "R. D de Rede," which Hutchinson translates into "Robertus or Rogerus Dom de Rede," and which, he thinks, refers to Umfranville, lord of Prudhoe, who died about the year 1325. Mackenzie tells us that "Redesdale at the time of the Conquest was given to Robert de Umfranville, on the condition of keeping it free from wolves and thieves: the former were easily reduced, but the latter retained their ground until a very recent period."

The next visit was to the Church, which has recently been restored with much good taste, and is a noble structure well befitting the old town of Elsdon and its extensive parish, which lays claim to a very high antiquity, and is supposed to have been a Roman town in the time of M. Aurelius Antoninus. The

skulls of three horses were shown, which had been found, built up in a part of the old Church, at the time of its restoration.

The day's enjoyment was crowned by a survey of the Mote Hills, again under the guidance of Mr. Arkle, who read to us some extracts from a paper on these hills contributed by him to the Berwickshire Field Club. "The construction of the Mote Hills at Elsdon," Mr. Arkle says, "has been universally ascribed to the Ancient Britons; but the time of their erection and their purposes, whether as places of defence or as temples of worship, are questions involved in impenetrable obscurity. The general appearance is no doubt that of a defensive position; but there is no incongruity in supposing that at the same time they might be used for civil assemblies, for the promulgation of laws, for the administration of justice, and for the celebration of religious rites and ceremonies." Our Moot Halls would seem to be the legitimate successors of the Mote Hills.

Several subjects of historical interest, but lightly touched on in this hasty sketch, are well worthy of a more detailed treatment, which it is hoped they may yet receive in connection with our proceedings.

The weather during the trip was delightful, and that circumstance, combined with the well-known determination characteristic of the Club to make the best of everything, converted what seemed at the outset something of a disappointment into a splendid success.

Some of the members remained till the third day, and thoroughly enjoyed a long stroll by the winding banks of the Rede, with its ever changing and beautiful scenery, to Woodburn, pleasantly situated near the old Roman station *Habitancum*, and the place where the Watling Street (leading from Chester-le-Street to Chew Green, the *Ad Fines* camp of the Romans) crosses the Rede. Hence to Morpeth, where the members dispersed to their respective homes.

The Sixth and last Field Meeting was held at Morpeth on the 5th of October. About twenty members left Newcastle by the mid-day train, and, under the guidance of Mr. Thomas Arkle,

they followed the north bank of the Wansbeck in its bending course. The water channels were flooded by early winter rain from margin to margin, thus making the narrow path so muddy and slippery that it was difficult to walk on it. But we were enlivened by occasional halts to listen to some tradition of the past—about the Chapel of our Lady, or the old folk-lore of the district. The lofty banks, almost hiding the small stream, glowed with the autumnal tints of the overhanging woods. Such few flowers and fungi as remained at this late season were gathered; but it was lamentable beyond expression to find that no trace could be seen of the beautiful ferns, so ornamental and so graceful, which once adorned this bank of the river. Plants, perhaps a century old, had been ruthlessly torn up from their natural home, to droop and die in a few days in some neighbouring town. The most graceful plant found in any abundance was the pendulous rush, still fresh in the sheltered hollows.

At the Mill the party was met by T. Sample, Esq., and conducted to the Castle, arriving there just in time to obtain welcome shelter from a heavy shower. They were kindly shown over the restored and delightfully situated building, in olden times a feudal home and stronghold, and until within a few years a romantic weather-worn ruin, in which state it was seen when our Club first visited it. The walls of the old castle are of immense thickness. Their original proportions are retained, subject to modern convenience and comfort.

Sheltered and refreshed by the kind hospitality of Mr. Sample, the party sallied out to see the spacious gardens, laid out on the large haugh near to the Castle. Here were strange plants from various remote parts of the world, growing in great luxuriance, in an isolated and sheltered corner, surrounded by the water and the wooded heights of the Wansbeck. Many of these plants were rare, quaint, and, for garden flowers, of gigantic size. All of them seemed thriving and healthy. For admission to the gardens the party was indebted to the Hon. and Rev. W. C. Ellis, vicar of Sheepwash.

A short visit was made to the Church adjoining the Castle, and then, led by Mr. Arkle, a short cut was taken to Morpeth.

A substantial tea was served at the Bull Inn, cordial votes of thanks were passed to Mr. Sample and the Rev. W. C. Ellis, and the last of the Field Meetings of 1883 was pleasantly brought to a close.

Besides the Field Meetings, two EVENING MEETINGS have been held during the year in conjunction with the Natural History Society.

At the first of these, a very interesting paper was read by Mr. Abel Chapman, entitled "Notes of a Visit to Spitzbergen in the Summer of 1881." I am glad to say that this paper will shortly appear in our "Transactions," and will be illustrated by lithographs executed by Mr. John Storey, from drawings by the author.

At the second Evening Meeting, Mr. Hugh Miller, of the Geological Survey, gave a very full and valuable account of the formation of River Terraces, with especial reference to those in our own district. This paper will appear in the "Transactions" ere long.

On the occasion of Mr. Miller's visit, the Club availed itself of one of its rules, and we had the pleasure to elect Mr. Miller and Mr. James Hardy honorary members. Mr. Miller was about to leave this district, and Mr. Hardy was one of the early members of the Club, and in conjunction with Mr. Bold he contributed to our "Transactions" the valuable Catalogue of the Coleoptera of Northumberland and Durham. He has for long been the able Secretary of the Berwickshire Field Club, from which sprung our own, and all the other Field Clubs in England.

Ladies and Gentlemen, having thus given some account of the meetings held during the past year, I desire now to make a few general remarks to you regarding our Club.

Many of those who have preceded me in this chair have contributed valuable and learned additions to our "Transactions." They have thereby helped to extend the well-earned fame of the Club. To follow them in this, I can make no pretence. I can claim to be, like some of you, a lover of Nature. But, with you

all, I feel pride in belonging to a Club which has numbered, and which now numbers, amongst its members men conspicuous as Naturalists, and which can produce a splendid record of service rendered to Natural Science. And, along with that feeling of pride, we have all a strong attachment to the Club because of the opportunities it has given us to enjoy many days of pleasant and intellectual companionship. I am an old member, and, with others whose familiar faces I rejoice to see still with us, I can look back to Field Meetings long passed. And I venture to say that we recognise them as among the most pleasant and profitable days of our lives. Many valued friendships were formed at those meetings; and amongst the memories we cherish most, are those of members of this Club who took part with us in our excursions, and who have passed on to the Silent Land. You may take it as a truism—I ought, perhaps, to say it is a platitude—that an earnest student of Nature, or a true lover of it, must have something of good in him, and that his friendship and companionship are worth having. He is seldom a selfish man. What is true of other love is true also of this love of Nature:

> "Love took up the harp of Life, and smote on all the chords with might;
> Smote the chord of Self, that, trembling, pass'd in music out of sight."

Now, I hold that the pursuits of our Club tend to develop that love—to widen our sympathies, to lessen our self-conceits—and to make our members more companionable by sowing amongst them the seeds of pure and lasting friendships.

It has long been a subject of interest to me to observe that what is true of the Naturalist searching after the Truth of Nature, is also true of the Artist who earnestly seeks after its Beauty. In character and mode of thought they have much in common. Both feel and respond to that "touch of Nature" which "makes the whole world kin."

It has been my lot, I may say my fortunate lot, to live much with Artists, and to count many of them as my intimate friends. And I desire to express my conviction, that if you would find the men, and the women, best able and most willing to give you

true sympathy in joy or sorrow, most helpful in beautifying your path of life, and most likely to exalt its aims, your best chance will be amongst the devotees of those twin sisters—the Truth and the Beauty of Nature.

> "For what is Truth
> But Beauty? Are not these but other names,
> Or the same names in other tongues, for that
> Which man must ever ardently pursue
> If he would truly live? And living thus,
> Shall not man's soul unfold and yet unfold
> To see Life's higher possibilities?"

The wealth of human sympathy in the Artist's heart was touchingly shown in my presence at the grave side of one of their number some time ago. A member of the Royal Academy, a dear friend of my own, a man of high promise, had been cut off on the threshold of a great career. When they laid him to rest, amid scenes of natural beauty which had inspired his pencil, and beside which he had desired to repose, there was hardly a tearless eye among his Artist brothers gathered by his grave. Those strong men of the world—not sinless perhaps, but welling over with human sympathy—were not ashamed to let their sorrow have its way. Their tribute of tears was as unrestrained and as simple as that which childhood pays. The cold reserve of the worldling was lost in a natural human sorrow.

I believe that to the Naturalist, as well as to the Artist, there has been given a larger share of human sympathy than is possessed by other classes of mankind. Whether this is a result of the reverent study of Nature, or that it pre-exists, I cannot pretend to say.

That all Artists and Naturalists are unselfish in their pursuits, I by no means assert. They have virtues in common, but they have also faults. And, strangely enough, selfishness is a common fault of the erring ones. This is seen when, falling away from nobler aims, they degenerate into mere collectors. Then the high qualities of sympathy and unselfishness disappear. In their stead you have the spirit of the miser, struggling for possession of things solely because they are rare. Artists there

have been who hid away their treasures, rolling them up out of sight; and, so-called lovers of Art, who spared neither time nor money to obtain old prints, regardless of their artistic merits, just because of what they called their "state." You have seen a selfish and fictitious value given to etchings and engravings, by the wanton destruction of the plates from which they were taken.

Of the Naturalist collector we have similar experience. An occasion for the exhibition of it arose when I was lately in London. A surgeon, who had devoted his life to the collection of specimens of Lepidoptera, died, and his collection was sold by auction. The Philistine newspapers made merry over what they described as a queer gathering of *virtuosi*, who for two successive days bid against each other with a zeal in which true love of Nature had no part, and which scorned all pecuniary considerations—one moth (*Nyssia papponaria*) being bid up to thirteen guineas, solely because it was believed to be the only one caught in these islands. One paper told the story of the French baron, who, being the possessor of the only two known specimens of a shell, gave a large price for a third which had turned up, and crushed it under his heel! A very different spirit from this, I am glad to say, animates the members and collectors in our Club.

Among the charms of our Field Meetings, very generally appreciated, have been the opportunities they gave for the enjoyment of scenery. But we have all heard mournings, especially by some of our older members, that "Ichabod" is now written over the once fair Tyneside, from which our Club takes its name, and that its beauty has departed. Now, I do not share that opinion. Changed though it is, since I tried to shoot curlews on Jarrow Slake, I am disposed to believe in Tyneside still as a fruitful field for artistic study. Smoke, that "black flag of Science," floating high from a thousand chimneys, is no flag of surrender of all its claims to artistic interest. True, there is not the olden beauty; but there is one of a more remarkable kind, and one which it is well we should now learn to appreciate.

I once heard an exclamation from a well-known artist, who was travelling with me on the River-side line. Suddenly recognizing what I may call the new attractions of Tyneside, and pointing to the varied colours of the smoke, and to the general tone of the landscape, he exclaimed, "What marvellous greys those are! See how well the red of the bricks and the tiles goes with them, and how cunningly it seems to be introduced! There is good work to be done here!" Another artist of my acquaintance proposes to take up this work, bringing round his little yacht, which has been engaged in similar service in the canals of Holland, amidst their picturesque surroundings. We may thus hope to see, ere long, our river and its banks, depicted with artistic appreciation and power, on the walls of the Royal Academy, before admiring London! This is no exaggeration. Look for yourselves, and see. All the elements of artistic beauty are there. The smoke itself is worth our study. There are white wreaths of steam, with their changing and evanescent forms. There is lovely pale silvery blue, laden perhaps with metallic vapour, but none the less beautiful. There is rich brown, in all varieties of tone, till it reaches the dark and rolling masses of deepest black. And when this mysterious canopy, with strong rays of sunlight piercing through it, hangs over some sparkling and sun-touched reach of the Tyne, below the high banks of which, as through a vista, stretch long lines of hulls and masts, I submit that you have materials for a picture more powerful and more worthy of note than can be readily found elsewhere.

I may now be permitted to say a few words about the origin of the Tyneside Naturalists' Field Club, for I have observed that some of our younger members have rather indefinite ideas regarding it. And it is fitting that I should do so on this occasion, because since our last annual meeting there has gone from amongst us our Founder and first President, Mr. Ralph Carr-Ellison. You will join with me in the expression of our deep regret at the loss thus sustained. It is some consolation, as far as our Club is concerned, to know that he lived to take an active

share in its advancement. He saw the ripened fruit of his labours, and he was permitted to look back with satisfaction to the interesting and not inglorious past of the Club he had founded.

Mr. Carr-Ellison—then Mr. Carr, for he assumed the name of Ellison on acquiring the landed estates of a relative—was a country gentleman whose kindliness of heart and whose cultivated mind gained for him the regard and respect of all who came in contact with him. He was a naturalist and a scholar. Scandinavian language and lore, in which he was well learned, had special attractions for him. Decided in manner, and not easily turned from his carefully formed opinions, he was well qualified to carry his views to successful issues; and, if we turn to the original rules of our Club, we see the wisdom with which they were drawn.

This Club was the second Naturalists' Field Club founded in this country. The first was the Berwickshire Club, founded in 1831 by Dr. George Johnston, of Berwick, and of that Club Mr. Carr was a member. Encouraged by the fact that it had succeeded in adding to the lists of the Flora and the Fauna, not only of Berwickshire, but of Great Britain itself, and this "by means as delightful as the end," Mr. Carr conceived and carried out the idea of forming a similar Club for Northumberland and Durham. The first meeting for its promotion was held in Newcastle, in the rooms of the Natural History Society, on the 25th of April, 1846. The Vicar of Newcastle, the Rev. R. C. Coxe, was in the chair. Mr. Carr moved the first resolution, which was that the Rules I have referred to be adopted for the guidance of the new Club. The thanks of the meeting were voted to Mr. Carr "for having suggested, and for his exertions in the formation of the Club," and he was elected its first President, which position he again held in a later year.

As to the Rules, they provided, *inter alia*, that five Field Meetings be held each year; that the members were to breakfast together at the nearest country inn; and that when the work of the day was over, a dinner was to be partaken of, for which the chairman of the day was to arrange, and which it was stipulated

should be a frugal one. Ladies were to be admitted as members. Wanton persecution of rare birds, and the extinction of rare plants, were to be strongly discouraged. Notes were to be accumulated, instead of specimens, "by which our closet collections would be enriched only at the expense of nature's great museum out of doors." Last, and certainly not least, the members were to endeavour to promote a taste for carefully preserving all monuments of antiquity from wanton injury.

The seed thus planted fell into good soil. Men able and willing took part in the work, and the success of the Club was soon assured. The Natural History Society of Northumberland and Durham held out a friendly and helping hand to the new Club, and they have gone forward hand in hand ever since. Before long, the proceedings of the Club attracted the attention of outside Naturalists, and its fame was established and spread abroad by the catalogues and anatomical papers published in the first volume.

In the first days of its career, as I have already said, this Club was indebted to the Natural History Society for valued aid. In the year 1864 the alliance of the two societies became more complete, as it was then arranged that the "Transactions" of both should be jointly published. The arrangement then made has continued till now, with great advantage to both. And I may mention that the volumes containing the joint Transactions are now eagerly sought after, and command a high price in the London book market. Many of those who formed the little band of earnest men who established the Club, and contributed to its fame, have, like our first President, passed away. Men, whom to know was to love and respect. But, thank God, we have some of them with us, and labouring for us still. Very quietly, it is true, and, as has ever been their wont, with no touch of ostentation. But the result of that labour, begun so long ago, and carried on so quietly that only few of their fellow-townsmen were aware of it, will appear before long. Citizens of Newcastle, who had not even a dream of it, will awake one morning to find their town made famous by the

opening of a Museum the renown of which will spread wherever Natural History is known.

The old Museum, with all its interesting associations, and in which so many of our meetings were held, has disappeared before a new order of things. The collections of the Natural History Society, so long almost hidden away in it, will come into broader daylight. We shall then be able, besides other treasures, to see and to appreciate the Hutton Collection of Minerals, and Mr. Alder's fine Collection of British Mollusca and Polyzoa (both presented by Sir William Armstrong), and Mr. Athey's extensive and unique Collection of Amphibians and Fishes of the Coal Measures (the gift of Lady Armstrong). And also the figured and typical specimens of Coal plants, chiefly from this district, given to the Society by the Institute of Mining Engineers. These will be displayed beside the works and contributions of one whose acquaintance and friendship we are all proud to possess. An Artist, as well as a Naturalist, whose unwearied labour, whose touch of genius, and whose noble generosity have provided for the New Museum a collection, the value and the beauty of which we cannot over-estimate. I, of course, allude to Mr. John Hancock, but for whom the New Museum would not have existed.

I may safely predict that such a Museum, with its ample and well-lighted space, and its almost unique treasures, will become a chosen resort for pleasure and instruction in Newcastle. And if you wish to confer a favour and a benefit on your friends, you can best do so by persuading them to join the Natural History Society, and thus to become free to partake of the varied advantages this Museum will afford.

I should like to see Natural History more generally taught in our schools. I believe the time will come when more attention will be paid to its study. Meantime, encourage your children to take an interest in it. As soon as they are old enough, give them small pocket magnifying glasses, and teach them to use them. You will thus open up to them a new world of interest and of wonder. Take them to the New Museum. What they see there may inspire some of them with a love for Natural

History, the pursuit of which will add to the happiness of their own lives, and enable them to contribute to the pleasure and welfare of those around them.

The following gentlemen were elected members of the Tyneside Naturalists' Field Club during the year 1883:—

At the Anniversary Meeting, May 11th, 1883:—Messrs. William Henry Brown, Northumberland Square, North Shields; John Thompson, The Willows, Walker-on-Tyne; Charles Fox, Low Fell, Gateshead; R. Ellis, 100, Rye Hill, Newcastle.

At Brampton, May 28th:—Rev. J. E. Elliott Bates, Millbourne Hall; Rev. H. E. Fox, South Bailey, Durham; Rev. Geo. Prince Hall, Winlaton; Messrs. Thos. Arkle, High Laws, near Morpeth; John Walker, Eastfield House, Corbridge; Geo. Gatheral, Heathfield, Hebburn; E. Gregory, Royal Engineers, Depôt; Arthur Tranah, Eldon Place, Newcastle.

At Settle, June 27th:—Rev. Thos. Austin, 1, Lovaine Place, Messrs. J. Wilson, Leazes Park, Newcastle; John Hedley, West Chirton House, North Shields.

The Field Meetings for 1884 were arranged to be held as follows:—

May 30th	Chollerford and Hexham.
June 25th & 26th (Race Week)	Alston, Cross Fell.
July	Low Row, Coomb Crag, Gilsland.
August 4th	Wensleydale.
September	Redcar and Staithes.
October 6th	Seaton Delaval and Blyth.

THE TREASURER IN ACCOUNT WITH THE TYNESIDE NATURALISTS' FIELD CLUB.

FROM JANUARY 1ST TO DECEMBER 31ST, 1883.

Dr.		£	s.	d.
1883.				
Jan.	To Balance brought forward	154	2	9
	,, Subscriptions	79	5	0
		£233	7	9

Cr.		£	s.	d.
1883.				
Jan.	By Box for Papers	0	15	6
	,, Journal, printing and issuing Circulars to Members	20	12	4
	,, Secretaries' Expenses and Disbursements	16	11	6
	,, Commission for collecting Subscriptions.....	4	9	3
	,, Postage, &c.	1	4	4
Dec.	,, Balance	189	14	10
		£233	7	9

Examined and found correct,

T. P. BARKAS.

The following gentlemen were elected officers of the Club for the year 1884–85:—

President.

G. H. Philipson, Esq., M.D.

Vice-Presidents.

John Philipson, Esq.
James Clephan, Esq.
John Hancock, Esq.
William Maling, Esq.

Ralph Carr Ellison, Esq.
Rev. J. F. Bigge, M.A.
D. Embleton, Esq., M.D.
Rev. Canon Tristram, F.R.S.
Rev. A. M. Norman, M.A.
Rev. J. C. Bruce, LL.D.
Rev. A. Bethune, M.A.
E. J. J. Browell, Esq.
Rev. R. F. Wheeler, M.A.
Prof. G. S. Brady, M.D.
H. B. Brady, Esq., F.R.S.
Rev. J. E. Leefe, M.A.
Rev. G. R. Hall, M.A., F.S.A.
G. H. Philipson, Esq., M.D.
Rev. R. E. Hooppell, LL.D.
A. S. Stevenson, Esq.

Treasurer.

Robert Y. Green.

Honorary Secretaries.

Richard Howse.
Thomas Thompson.

Committee.

Henry C. Abbs.
T. W. Backhouse.
Joseph Blacklock.
T. T. Clarke.
William Dinning.
D. O. Drewett.
John Glover.
Rev. J. M. Hick.
Edward C. Robson.
John F. Spence.
John T. Thompson.
Col. J. R. Young.

Auditors.

J. S. Forster.
T. P. Barkas.

XIV.—*Letters from C. Darwin, Esq., to A. Hancock, Esq. Communicated by John Hancock, Esq.*

The following letters from the late Charles Darwin, Esq., to the late Albany Hancock, Esq., are of so interesting a nature, that it has been thought they would be suitable for the pages of our Transactions, the more so as they specially refer to the discovery and description of an interesting form of burrowing Barnacle, *Alcippe lampas*, which was first observed on the Northumberland Coast by Mr. Hancock, and afterwards described by him in a paper communicated to the British Association, at the meeting held in Birmingham, 1849. The references given are chiefly to the Monograph of the Cirripedia by Charles Darwin, published by the Ray Society.*

No. 1.

Down Farnborough, Kent.
(Post mark Sept. 21st, 1849).

Sir,

I trust to your kindness to forgive a stranger taking the liberty of addressing you. I have been for the last two years (at least such portions of it as my health allowed me to work in) employed on a monograph, anatomical and systematic, of the Cirripedia; it was consequently with the greatest possible interest that I heard your admirable paper at Birmingham. I made a few remarks on the subject, which will perhaps appear in the *Athenæum*.

In S. America I collected an allied form, parasitic in the Concholepas, and which possibly will be included in the same order with yours, but which I think must certainly form a very distinct family.

I was very glad to hear from Mr. Taylor that your paper

* Notice of the Occurrence, on the British Coast, of a Burrowing Barnacle belonging to a new Order of the Class Cirripedia. By Albany Hancock, Esq. Annals and Mag. of Nat. Hist. 1849, vol. 4, 2nd. ser. pl. 8, 9. And Trans. Tyneside Naturalists Field Club, vol. 1, p. 327. June 1849.

will appear in the Annals, and then I shall be able to study it. I have no sort of pretension to claim any favour from you, but if you could at any time spare me one or two specimens *in the shell*, preserved in spirits, it would be a most material kindness. I would pledge my honour not to publish anything so as to interfere with any further researches you might choose to make on the species. No one can be aware better than yourself, after your excellent labours on the Mollusca, that when one is employed on a monograph, trifling points are found to be of interest, which are known to be so only to those employed on the class, and it is on this ground that I should so much like to dissect a specimen of your genus. I have now dissected species of all the genera of the Cirripedia, and have nearly finished the systematic part of the Pedunculata, but yet from the extreme slowness of the rate at which my health allows me to work, my monograph will not appear for one or two years, so that I could not encroach on anything which you might choose to publish further on the subject.

I trust that the great interest which I have felt in your interesting discovery will make you forgive my taking the liberty of asking you so great a favour as that contained in this letter.

I beg to remain, with much respect,

Yours faithfully,

C. Darwin.

To A. Hancock, Esq.

No. 2.

Down Farnborough Kent,

Sept. 29th, 1849.

Dear Sir,

I am truly obliged to you for your very kind letter and offer of specimens of Alcippe. You cannot imagine how much I shall *enjoy* seeing in your paper and in actual specimens a new form of Cirripede; for I am wearied out with examining scores and scores of closely allied common Cirripedes.

I should have written about Lithotrya in former letter, but I had hardly space, and I did not know whether you would like to have my views on the point. I conclude that the Lithotrya forms its own holes, from having seen *numerous specimens*, and (four or five species) large and small, all *exactly* fitting their cavities. The calcareous cup is indisputably (I speak after careful examination, with dissolution in acids, etc., etc.) formed by the Cirripede, and is common to most (I believe all) the species of the genus. You are perfectly right that the calcareous cup is never moved. But the Cirripede inhabits (as far as I have seen) only cellular rocks, or corals, or shells (such as the Cirripede Conia,* with large tubes), and the pupa crawls into some minute cavity, and there fixes itself for ever, and then as it grows enlarges the hole to required size; this it effects by the edges of the valves and of the minute scales on the peduncle being sharply serrated; and as of course the serrated edge would soon be blunted, the calcareous scales on the peduncle are moulted with the membrane on which they are fixed, and new sharp ones periodically formed. This moulting of calcareous scales is a unique case, and I have no doubt is in relation to their boring necessities. I believe this is the way which my Asthrobalanus,† which inhabits the Concholepas, also makes its cavities; and its outer tissue is studded with elegant minute trifid and quadrifid points; and the shell is apparently first perforated by other animals; but I have got to go over this again with Asthrobalanus, but I have had the misfortune to lose nearly my whole stock of specimens, of which I collected thousands, for fifteen years ago in the Chonos Archipelago I described its peculiarities in some detail.

I venture to predict that if you take the outer tissue of Alcippe and clear the corium from it and place it under the compound microscope, you will find the rasping minute points, and I believe you state that it inhabits shells abounding with cavities of Cliona, etc., etc.

I am most particularly obliged to you for informing me of

* = *Tetraclita*, Schumacher. See Darwin's Monograph, Balanidæ, p. 321.

† = *Cryptophialus*. Ibid. p. 563.

Lovén's Cirripede, of which I had not heard. I should be *most grateful* for a transcript of the paper and drawing, or if the book be not above 2 lbs. or too precious could it not be sent, and I would gratefully repay postage, and thus save Mr. Alder the trouble of transcribing, to whom pray give my sincere thanks. I have in my collection this Cirripede as I suspect; it is like an Otion,* and from not having calcareous valves might be called an Alepas; but, strange as it would appear to any one who had not studied the internal structure of these animals, it is not even one of the Pedunculata, but belongs to the sessile division, and forms a new genus between Tubicinella and Coronula. I should have been very sorry to have overlooked Lovén's description.

I presume you have a superabundance of materials, but if at any time you would like to have my small collection of naked Mollusca, made during my circumnavigation, they are at your service; but I fear specimens preserved for many years in spirits must be almost useless. I think there are some new genera amongst them. Once again allow me to thank you cordially for the very kind manner in which you have taken my requests, and believe me, dear Sir,

Yours sincerely obliged,

C. Darwin.

To A. Hancock, Esq.

I see in the *Athenæum* they have omitted to express how valuable I thought your discovery, and how interesting your whole paper. I am very curious to see what you say about the palpi. I could not follow the reading aloud of this part, but if I understood right, the palpi are wonderfully different from anything I have seen in the Cirripedia. I think it possible that Alcippe and Arthrobalanus may turn out distinct *orders*. The metamorphosis is certainly different. My larva has no *thoracic* legs, where yours has; mine is binocular, yours uniocular, etc., etc. Yet the three pairs of cirri, the great labrum, and habits are certainly strong points of resemblance.

I ought to apologise for the length of this letter.

* = *Conchoderma.*

No. 3.

(Postal date Oct. 30th, 1849.)

Down Farnborough, Kent.

My dear Sir,

I have to thank you sincerely for many things. Your specimens arrived quite safe. I have as yet taken only a cursory glance at them; for I have an odiously tedious job of compiling long generic descriptions from my specific descriptions. When I have done in a fortnight's time, I will enjoy the treat of having a good inspection of Alcippe. I hope by that time your paper will be out, as it will save me much time in comparing every part with common Cirripedia; indeed I will wait till I can get the number with your paper. It is an immense time since I have seen a new form of Cirripedia. At the same time I will look over my Mollusca, and my few notes made at the time; and if they turn out of the slightest interest to you, I shall be heartily pleased by your acceptance of them. I will be careful of the specimens of Alcippe. Your sketches are *very* spirited. The Cirripede from Australia is the *Ibla Cuvieriana* (= *I. quadrivalvis*, Cuvier); that from Madeira is an unnamed species, which I have unwillingly been compelled to make into a new and insignificant genus. I have called it (supposing name be not used) *Machairis celata** (from being encrusted with bark of the Antipathes). If you have *any other* Cirripedes from foreign localities, and would allow me to examine them, it would be of great service to me.

Will you please to give my sincere thanks to Mr. Alder for the specimens, and for the great trouble he has taken in copying Lovén's paper. It is a most interesting Cirripede, and the type of a new family or order, for it has no relation to Alepas, the animal of which I know well. I must write to Loven; his description is unfortunately short. Will you add to your kindness by some time asking Mr. Alder to what place the Royal Academy of Sciences given in the title belongs. Lady Lyell translates the title as 'Extract from a Review of the Trans. of the R. Acad. of

* = *Oxynaspis celata*, Darwin. Monog. of Cirripedia, Ray Soc., 1851, p. 134.

Sciences, 1st series, 1844, p. 192–4.' Secondly, will you be so kind as to tell me on what being (for I cannot read the word) your specimen of the *Ibla* is attached. And thirdly, whether you had any motive for calling your Cirripede 'Alcippe,' as perhaps I will change my long name of Arthrobalanus for a shorter one. Any time will do for an answer.

With respect to Lithotrya. The shells have relation to diameter of hole, but the shell-part of full-grown ones, *I believe*, project beyond their hole. This is hard to know, as peduncle shrinks much from drying. Holes are bored in all directions. The animal often *rises* a quarter of an inch in its hole from thickness of cup. Very young specimens have cups, I *believe* at earliest period. I cannot describe the whole process of fixing in letter, but I must think it quite impossible that any Cirripede can sink its basis in any object. I have thought that the larva of Lithotrya instinctively (and this not wonderful) creeps into the crevices of the coral-rocks to that depth, from which it can when nearly full-grown freely reach the surface; in the interval I believe it feeds on Infusoria in the water circulating in the crevices. I once thought that the larva of Arthrobalanus might have bored its hole with its prehensile antennæ, but I cannot now believe this. But there is another view or conjecture, which is perhaps the most probable, viz., that the larva (in second stage) boring a minute hole by an acid secreted from some gland, and through some duct and orifice in the prehensile antennæ (alluded to by me in *Athenæum*), by which afterwards the cement-stuff is poured out. This view would perfectly harmonise with the facts, of which I cannot doubt, that the Cirripede after metamorphosis can never alter its point of attachment; and secondly, the apparatus of minute points for enlarging its cavity in Lithotrya, Arthrobalanus, and Alcippe, is equally applicable.

But I shall utterly weary you with this discussion. Your statements about cavities of Alcippe make me doubt my view of the larva creeping into already existing cavities.

With my sincerest thanks,

Yours very faithfully,

C. Darwin.

No. 4.

(Postal date Dec. 26th, 1849.)

Down Farnborough, Kent,
Dec. 25th.

My dear Sir,

I am very much obliged for your last very interesting letter, with your answers to all my queries, and the copy of your paper, which I am very glad of, though I take in the Annals.

I have not yet looked at Alcippe, for I have found my writing work run out, and I have lately received several new pedunculate species to describe. I have had such a misfortune in the loss of a parcel of Cirripedes from Copenhagen, amongst which was the curious *Alepas squalicola!** the knowledge of which I owe to Mr. Alder's kindness.

I have of course read your description of Alcippe, and it is most clear and definite. I hope to put Arthrobalanus† in the same order with it, but it will be stretching a point to do so, and they must form distinct *families*, *more* distinct than any Pedunculate and any Sessile Cirripede are from each other. I hope before long to indulge in a look at Alcippe. I have had occasion to re-look over many specimens of Lithotrya, and am as fully convinced as ever that the basal cup is fixed at a very early period, and is never moved. In one specimen several specimens were embedded in rock, parallel but in reversed positions (and others at right angles); and of the parallel ones the greater number had their capitulums (*i.e.* shells or valves) directed from the exterior surface of the rock inwards, so that they could never reach the surface, and must have lived in a subterranean cavity. I am as much as ever in the dark, whether the larva *creeps* in or *bores* in.

I had intended, but forgot, to ask you about the Clitia. All which I have seen (except some rare foreign species, which I have not yet touched) were fixed on *fuci* and stones; and if it be not asking too great a favour, I should be very much obliged if you would permit me to look at any fixed on shell. Several

* = *Anelasmas squalicola*. Monog. of Cirripedia, Ray Society, 1851, p. 170.

† = *Cryptophialus minutus*, Darwin. Monog. Cirripedia, Ray Soc., 1854, p. 566.

months ago I had *one rather* careful inspection of the basal membrane, and was much surprised not to be able to see the prehensile antennæ of the pupa, or any orifices for the cement-stuff; yet from analogy I can hardly doubt that Clitia fixes itself like all other Cirripedes, in the manner briefly explained by me to the British Association.

In the case of Coronula, Tubicinella, and Chelonobia, I have *fancied* that the sinking was entirely or chiefly owing to the growth of the surrounding parts of the animal to which the Cirripedes were attached. I am much surprised about Clitia, and it shows me that there is even in common Cirripedes something about their attachment which I do not understand at all. I have seen, as I *believe*, that the cement could corrode through the membrane of its own peduncle, but not act on the calcareous scales supported by this membrane; so that your fact of the Modiola is still odder, and I hope you will allow me to quote it from you.

I have seen the larvæ of most of the species of Anatifa, and I think of *A. vitrea*,* but I have had either to dissect them out of the egg and just after their escape, and never as yet when naturally sent forth from the parent. In the state in which I have seen them they certainly had not any 'process or pedicel,' but exactly at the spot figured by you lies their mouth, which is very slightly prominent, without any trophi, and leading into an œsophagus running *anteriorly* and lost in cellular matter. If you would let me have a few of these specimens I should be *very much* obliged, and especially if you would give me any precise observations of your own on this 'pedicel,' for I do not in the least doubt that with all your experience in dissecting your observations would be more trustworthy than my own. Goodsir figures something like a masticating organ attached to base of legs of larvæ, which I could never see, and which, if such exist, would be a strange coincidence with Limulus.

No doubt you are aware that in all Cirripedes the larva from the stage you have figured becomes (so called) bivalve, hexapod, with prehensile antennæ, binocular, etc.; and when it attaches

* = *Lepas fascicularis*. Mon. Cirr., Ray Soc., 1851, p. 92.

itself it is in fact a natatory pupa, for it has no mouth, only a rudimentary shrivelled œsophagus, surrounded by the forming trophi of the young Cirripede. Asthrobalanus (= *Cryptophialus*) alone passes the first larva stage in egg, and appears when first born with prehensile antennæ, two eyes, etc.

But perhaps I weary you with these details; one forgets that others do not care so much for a subject as he who is at work on it.

I have not yet gone through my bottles for Mollusca, but will you be so good as to send me one line, to say whether you care for any naked Terrestrial (as Vaginulus, Parmacella), or aquatic naked Mollusca, or for any of Cuvier's "Tectibranches," as Aplysia, etc., or whether exclusively for the Nudibranch. I believe I have a few of each order. I fear that you will think I have written to you at unreasonable length.

Pray believe me,

My dear Sir,

Yours very sincerely,

C. Darwin.

I begin to think I shall spend my whole life on Cirripedia, so slow is my progress, working only two to three hours daily.

No. 5.

(No postal date. 1850 in A. H.'s writing.)

Down Farnborough, Kent,

15th.

My dear Sir,

I ought to have sent you a line sooner to say that your specimens arrived safely. I will venture to keep the Madeira one till I commence reworking on the Pedunculata. I have marked outside the box to be 'returned to you' after I have taken a few.

The Balanus I will return almost immediately. It is one of the *very few* species which I dare name with little or no hesitation without opening (with the aid of some part exposed near the

basis). It is the *B. sulcatus* of Bruguière = *Lepas balanus*, Linn.* You sent me formerly specimens mingled with another species attached to a Pecten with the Clitias.

Do you know the latitude on the coast of Greenland? It would be valuable information for me. If you do even approximatively, will you write it on slip of paper, without anything further, and send it me? I have this species from Iceland.

With respect to Lithotrya, I feel a conviction that if you had seen all the specimens which I have, you would not doubt that all the species bore, in whatever manner this may be effected.

Yours very sincerely,

C. DARWIN.

No. 6.

(No postal date.)

Down Farnborough, Kent,

May 12th.

My dear Sir,

Owing to a perhaps foolish habit of not reading periodicals when they come out, I have only just read your very interesting paper on the boring of Mollusca in the Annals; and this reminded me that you wished for more information regarding Lithotrya. I really do not know what to give. I have three specimens of Lithotrya, and I enclose one for you. I have picked out one that has lately moulted (this moulting of scales is unique in whole order of common Cirripeds), and therefore has the scales on peduncle, with the teeth pretty sharp. The valves, of course, are not moulted, but the old layers scale or are rubbed off. I have not *one* with the basal calcareous cup, though several have been lent me. I wish you could see the basal cup. I feel SURE it would confirm your opinion that it could not be the borer. I can see no reason yet to alter my opinion, that Lithotrya either crawls into the cavity, which it enlarges, or, if not, that the larva has the power of boring a hole, in which it fixes itself and

* = *Balanus porcatus*. Mon. Cirr., Ray Soc., 1854, p. 256.

undergoes its metamorphosis. I have several foreign species of Clitia, and I will attend to their to me quite wonderful boring powers.

Yours very sincerely,

C. DARWIN.

No. 7.

(No postal date. Marked "1850?" by A. H.)

Down Farnborough, Kent,

Sunday.

My dear Sir,

I send one line to beg you to keep my MS. as long as ever you like. I guessed why you did not write; it was wholly unimportant. I am sorry for the smash, and sorrier the species do not turn out more interesting; it is, however, as you say, curious about the Ranges.

The Balanus sent (for which many thanks) is the common *B. Cranchii* of British authors. I have never seen it from north of Tenby, in S. Wales, I will return it hereafter if requested.

I should be very glad to see the Greenland Balanus. Please state when sent whether to be returned. You know I must disarticulate a specimen for examination.

Have you several specimens of the Madeira little pedunculate Cirripede (which I named *Machairis*,* and have now changed into *Oxynaspis*), and if so, and you would *lend* or give me one for disarticulation, I should be *very glad*, as my specimens are all in *utter* state of *decay*, and several points of the dried animal remain unexamined by me. (I have this genus fossil from Chalk!)

I mean now to continue at the Systematic part till I have finished; a period which will arrive Heaven only knows when.

Many thanks for your letter. In haste.

Yours truly,

C. DARWIN.

* Monog. Cirripedia, Ray Soc., 1851, p. 133.

No. 8.

(Postal date Dec. 28th, 1850.)

Down Farnborough, Kent,

Dec. 25th.

My dear Sir,

As you have attended with such eminent success to the boring of animals into rocks, you will perhaps like to hear that I believe I now understand the boring of Lithotrya, thanks to the enclosed drawing (which please return) sent me by Steenstrup without text. I suppose the same explanation is applicable to Arthrobalanus (= *Cryptophialus*, Darwin), and I should think Alcippe (for the presence of the calcareous disc is not material to the change of place), but not, as far as I can see, to Clitia.

Since receiving this same Plate I have had a good deal of rock, bored by *L. dorsalis*, given me, and I now find out, for the first time the following important facts:—(1) That the animal bores to its full depth when young, and afterwards only increases the diameter of its hole. 2nd, That a cup is only formed when the animal has ceased boring to a greater depth; but that before a cup is formed, a succession of little discs, exactly as represented, are deposited on one side of the hole, each new one, at each fresh exuviation, being placed $\frac{1}{20}$th or $\frac{1}{16}$th of an inch, or even more, beneath that last formed; the disc or cup, as I was always certain, never itself being moved. 3rd, The lowest disc is *never* at the bottom of the burrow, and this is faithfully represented in the Plate. Lastly, the skin of the peduncle at this *bottommost* part, at first, after each exuviation, is studded with minute calcareous beads, which are soon fairly worn away; and the beads are succeeded by hard horny star-headed points, which are also much worn away before a new moult. So that there is good wearing agency. (N.B.—I found specimens with perfect coat underneath old coat nearly ready to moult, so no possible mistake.) I should have said that as soon as the animal begins to increase much in *diameter* the chain of little discs are of course all worn away, so that no trace is left in full-sized specimens.

In the drawing you will at once understand how the animal

travels, by imagining a set of . . or exuviæ attached to each of the little discs one above the other. I have seen a row of discs extending an inch in length. (The teeth on the valves and on the beads on the peduncle, with their exuviations, sufficiently explain the mere increase in diameter of the burrow).

I cannot explain in a letter how the discs are fixed; but it is in all other Cirripedia by a cement or tissue (for I hardly know which to call it), which primarily debouches at the penultimate segment of the prehensile antennæ of the larva (this cement is formed by a gland, strange to say, which is certainly part of the branching ovaria), and subsequently during life, in different Cirripedia, either through these two same orifices, or out of two *fresh* or only one fresh aperture placed symmetrically or irregularly, or again through numerous apertures placed in a regular circle; so that it is nothing unusual in Lithotrya for the discs to be fixed symmetrically in a straight line. In Scalpellum the peduncle is attached to the thin stem of the Coralline by apertures, through which the cement debouches, placed quite symmetrically in a straight row along the ventral side, a new one being opened at each exuviation.

But I must stop, and not weary you. I think the drawing will make you understand what I mean better than my perhaps ill-expressed explanations.

I have not yet looked at Alcippe! But do not suppose that I undervalue your kindness in having sent me the specimens; but I have been working like a wretched slave at *mere species*, and have many more months' work, and till I have completed this slavery I have not heart to begin work of interest, for I think I should never get courage to resume the drudgery of describing species and making out synonyms. I hope this letter will not bore you.

Believe me, my dear Sir,

Yours sincerely,

C. Darwin.

P.S. The accompanying specimen of, as I suppose, a Cliona you can throw in the fire if of no interest to you. From northern part of Patagonia.

No. 9.

(No postal date. Marked 1850 by A. H.)

Down Farnborough, Kent,
Saturday.

My dear Sir,

I am ashamed at myself to think how long I have taken to send you my Mollusca. I have now got them in a bottle, and will send with them a catalogue of localities. There are about sixty packets, though some are duplicates. I send with them the *rudest* notes of colour and size made at the time. The colours are given by comparison with Pat. Symes' (?) nomenclature. The notes are those of an *ignorant schoolboy*, as I was almost then, and shamefully written. I would have copied them out if they had had any value. Will you nevertheless preserve these notes, for as one sometimes likes to see an old book, so I like to keep my wretched zoological notes. I fear my specimens can be of hardly any interest to you, they must be so shrunk from the spirits. I *think* there are one or two new genera. I will despatch the box with large bottle on next Wednesday, the first day our carrier goes. You will understand I do not want specimens ever returned. If there should be any part of MS. which you by chance should wish to read, I will with *pleasure* copy it.

Very many thanks for the Clitia. It has astonished me and convinced me of my ignorance. I entirely give up the burrowing of your Alcippe and my Arthrobalanus (= *Cryptophialus minutus*); I *only* do not give up Lithotrya, from its large misshapen cup being so ill-formed for burrowing, and from its having a beautiful rasping apparatus. How difficult it is to discuss any point by letter. I now see that I omitted to mention to you that *all round* the base, and therefore widest part of the head or shell on the top of the peduncle, there is a beautiful rasping rim or circular toothed saw; renewed, moreover, during every moult, when the shell and animal increases in size; and as the peduncle has great power to lengthen and shorten and twist itself about I cannot doubt, and if you were to fix a young Lithotrya at the

bottom of a deep hole of the diameter of a pin or straw, during growth the animal would be enabled to enlarge it to any extent. I confess I am quite puzzled by Clitia. It appears to me, from your specimens (which I must hereafter further examine), that the whole of the corrosion is effected round the margin of the base; that is, that no corrosion or wear goes on except round the growing basal edges. Did you come to this conclusion? I cannot doubt that the shell is so fixed that it cannot move; certainly there are no sharp points on basal membrane, as I have formerly examined it under high power. Does not your fact of the Modiola show that the action is effected by solution, or at least not mechanically.

You ask me about Goodsir's male Balanus. It is quite a mistake. His *male* Balanus is a *female* crustacean allied to Bopyrus, and his *parasite* is the male of this female.

But now comes the odd case. I have found two genera of Cirripedes with *males* separate and parasitic on the females. In these cases I am sure there can be no mistake, though I will not take up your time with details.

I have not *yet!* looked at Alcippe, for ever since writing last to you, my two-hour-per-day work has been occupied with a tiresome set of fossils. I have the curious *Alepas squalicola* sent me from Copenhagen, but I have not looked at it yet.

Yours very sincerely,

C. Darwin.

No. 10.

(No postal date. "1851" by A. H.)

Down Farnborough, Kent,

June 8th.

Dear Sir,

I am going to beg you to endeavour to procure me a very great favour from Mr. Alder, namely, the loan of the volume or of the plate of Lovén's *Alepas squalicola*, of which he most

kindly sent me an outline tracing. Seenstrup sent me one specimen, which I dissected, after comparing it externally with the drawings, and now I am *most anxious* for Mr. G. B. Sowerby to copy two of the figures for my volume for the Ray Society, for which the plates are now engraving. I do not know whether there is a copy in the British Museum, and if there be, it would be very troublesome to obtain permission to have a copy made, and such would not be so accurate as if Mr. Sowerby could have the plate at his own house. I have charged him, in case Mr. Alder would confer this favour on me, to take the *greatest* care of it, to acknowledge its receipt, and to pay its return carriage, and not keep it long. Mr. S.'s address is

29, Albert St.,
New Camden Town,
London.

Now that I am in the way of begging favours, I will ask conditionally another. You once sent me a spirited sketch of an Ibla from Australia. Have you more than one or two specimens. I have the greatest wish to possess the very base of the peduncle *still attached* to whatever it adheres, especially if the surface be smooth. It is too long a story to tell why, but hereafter, if you look at my monograph, you will admit the importance of the point.

* * *

Pray forgive my giving you all this trouble. I see that you continue always hard at work. I have lately been reading with great interest your papers in the Annals on the Bryozoa.

Believe me, yours sincerely,
C. DARWIN.

P.S. Will you forgive my sending so untidy a note, but writing the above reminded me that some time since I purchased four specimens, which until this minute I unaccountably have

forgotten; but I see all are attached to a most rugged surface. If yours happens to be attached to anything *smooth*, and you could spare the *base* of the peduncle *still* attached, I should be very much obliged.

No. 11.

(June 22nd, 1851, by A. H.)

Down Farnborough, Kent,
June 22nd.

My dear Sir,

I write merely to thank you very much for your assistance regarding the book, and to request you to especially thank Mr. Alder when you see him for his kindness. I am much obliged for the offer of the Iblas, but being on a rugged support I do not think they would aid me.

Pray believe me, yours sincerely,
C. Darwin.

You can return the MS. whenever you like, but I should be sorry to lose the pages, though of no value.

No. 12.

(25th Dec., 1852, by A. H.)

Down Farnborough, Kent,
Dec. 25th.

My dear Sir,

You will probably remember that you called my attention to the following facts, that Verruca (= Clisia, etc.) (1st) has the power of excavating a slight depression for itself; but that (2nd) epidermis on a shell quite stops this process; and (3rd) that under its middle there is sometimes a hollow, sometimes with chalky matter. I have just been at work on the

genus, and find these three facts occurring in three different species from different quarters of the world.

My object in writing is to ask you to look to one point in your collection; but first I will mention what results I have come to. I began with a *very strong* leaning to the view which you advocate, that the excavation must be due to mechanical agency, but *unwillingly* I have been driven to hypothetical chemical action. My grounds of belief are as follows, and I should be grateful for your opinion, viz.:—

(1) I can discover no sort of boring contrivance on margin of shell, or on under side of basal membrane; and there is no difference in appearance in these parts when an individual has bored and has not in the least bored. I have examined the single shell, and cleaned with potash, and after acid, with all powers.

(2nd) Either the shell or basal membrane must, on mechanical theory, be the wearing agent; and certainly, as far as the central hollow, it must be the basal membrane; but the basal membrane is united to the shell and animal's body by (besides corium and epidermis) only a circle of fibres, which Prof. Quekett, after most careful testing, says are *only ligament:* hence I think it impossible that the basal membrane can be moved (at least near the circumference, where the animal's cirri cannot reach), or, again, that the shell can be moved, if we look at the basal membrane as the fixed point.

(3rd) When a central hollow has been formed, the basal membrane (in this case generally brittle or *cracked*) is loose over this middle part, but was once *certainly* attached, as I have found the prehensile larval antennæ in the middle surrounded by the ordinary cirripedial cement, which certainly would require considerable mechanical power to separate from any object of attachment, and yet there is nothing whatever over this central portion of the basis but the open sack: dissolution of the shell, on the other hand, to which the cement was attached, would perfectly explain the appearance.

(4th) As you state the epidermis of shells quite prevents the wearing, except where abraded or cracked; and I further find

the epidermis of *Balanus lævis* (of which I send a valve, *not* to be returned) is equally protective; now this membrane is so weak, that I cannot believe it could resist mechanical wear and tear, sufficient to wear into solid shell. So again Laminaria (when not uneven, and so slightly ploughed up, like cracked epidermis), though not hard, is not at all excavated; again, I have specimens on two pieces of slate rocks (one rather soft), which contained *no* calcareous matter, and were not in the least affected; whereas a third specimen of hard *marble* was excavated.

(5) The cement-ducts *might* pour an acid over any part of the basis; but that they do so is a mere hypothesis. In *Lepas fasciularis* they must I think secrete some gas (carbonic acid gas?). I should have remarked that owing to the generally reticulated state of the cement round the central hollow, lime dissolved under the central hollow might easily escape.

This is the state of the case, as far as I can make it out. Will you forgive the length of this letter, and tell me what you think? And further, will you see whether you have specimens of Verruca attached to any softish rocks or substances, without calcareous matter, and look and see if they act on them?

In two weeks' time I shall positively at last, after a quite ridiculous lapse of time, look at your Alcippe, which I have never done yet! Have you anything new (or any fresh specimens to spare) on this most curious genus? I should be *pleased* to hear that time or inclination had led you to look at what I have said on the sexes of Ibla and Scalpellum, about which I remember once writing to you; and which facts appear to me curious.

Again I beg forgiveness for the length of this letter, and remain,

My dear Sir,

Yours very faithfully,

CHARLES DARWIN.

A. Hancock, Esq.

I do not think my wretched schoolboy MS. on the outlandish Mollusca has been returned? Has it?

No. 13.

(Postal date Jan. 12th, 1853.)

Down Farnborough, Kent,
Jan. 10th.

My dear Sir,

I am uncommonly obliged to you for taking so much trouble as to write at such length to me; though in truth, when I think of your many important pursuits in Natural History, I am ashamed to have lost you more than one good hour of time.

Your cautions and suggestions will be of considerable service to me, as leading to fresh observations, and making me explain some points more clearly. I will not take up your time in going into several points you notice in this letter, but they shall all be more or less attended to in my book.

I may just inform you that when a ribbed shell is cut through it can be seen that the marginal erosion* does not *graduate* into the central hollow; indeed if the whole base was simultaneously being eroded it is hard to see how the basal membrane and shell could be firmly attached. I quite agree that more specimens on calcareous and non-calcareous supports should be examined, and I will write to a naturalist in Devonshire to collect for me. I think, however, you did not understand that there were *several* specimens on the two slate-rocks and hundreds on the Laminariæ.

I am quite delighted at what you say about my little friends, the complemental males: I greatly feared that no one would believe in them; and now I know that Owen, Dana, and yourself are believers, I am most heartily content. I entirely agree with you on your remarks on cross-impregnation. Some years ago I set to work to collect facts on this head, but I have as yet done nothing with them. Such a view as yours is the only foundation, I am well convinced, to Steenstrup's rather wild Memoir on the non-existence of Hermaphroditism in Nature, though he extends the doctrine to mere physical organs!

Many thanks for the wretched MS. returned. I am quite sorry I asked for it, for I never dreamed that you had not long

* Diagram in illustration given in letter.

ago got what little good you could out of it. I shall be pleased at your doing whatever you liked with my specimens, etc.

You shall hear when I have *. . . with Alcippe. The other evening I read over your paper, and could not get to sleep for hours, from thinking of its curious and anomalous structure. I have some other specimens of yours.

With my sincere thanks,

Believe me, my dear Sir,

Yours sincerely,

C. Darwin.

No. 14.

(No postal date.)

Down Farnborough Kent,

Jan. 29th.

My dear Sir,

I write in a hurry to catch to-day's post to beg a favour and to apologize. For the former first: I have been *deeply* interested by Alcippe, though I have not added much to your excellent description, excepting perhaps on the homologies (as compared with other Cirripedes) of the sexual parts. I am almost driven mad by its generative system, and I write to ask whether you have any dry shells with Alcippe you could send me, as I think I could get some *considerable* good from them. I am most anxious to examine *many* specimens taken at different times of the year. I should be *most grateful* if you could send me such by post, allowing me to pay postage if heavy. Alcippe has *no* relation to my burrowing South American little Cirripede.

Would it be possible to employ for me any fishermen to get the shells now? though specimens taken *later* than these you sent me would perhaps be most useful to me; but any now would be of greatest interest to me. My surmises are too vague and

* A piece of the letter torn off here. Perhaps "grappled" is the word used.

too long to tell in this note, and perhaps all a blunder, but I am dreadfully perplexed.

Now for apologies. Can you forgive me when I tell you that I have cut up all the specimens you lent me? I fear I have been unreasonable, but I have trusted to the extreme kindness you have shown me in all your correspondence. Will you forgive me?

Yours very truly,

In haste,

C. DARWIN.

No. 15.

(No postal date.)

Down Farnborough, Kent,

Feb. 10th.

My dear Sir,

I trouble you with one line to say that amongst the few remaining and on the cut up and previously (imperfectly as it turns out) examined specimens I have found *plenty* of male Alcippes, indeed hardly any without some, so that I am in no want of more specimens at present. I should, however, be very glad to have hereafter some *few* to distribute in a dry state on the Continent, when I return the specimens in my possession; and indeed I should like a few more to examine the form of cavity, though I fancy I have made out this pretty well. You may imagine how peculiar the appearance of the male Alcippe is when I mention that, though having had experience how diverse an aspect the males put on, I now know that I looked at a male during the first day or two, and never dreamed it was a Cirripede! I suppose after all you have done in the anatomy of the Mollusca no structure seems very difficult to you to make out, but I have found Alcippe one of the most difficult creatures I have ever attempted to make out.

Yours very truly,

C. DARWIN.

No. 16.

(Postal date 12th, 1853.)

Down Farnborough, Kent,

Feb. 12th.

My dear Sir,

I will begin a summary of what I have been able to make out on Alcippe, imagining you feel interest enough to read my scrawl. You must believe that I express myself positively only for brevity's sake.

Mouth.—Every part peculiar, not strictly on normal type of Lepadidæ; the rudimentary palpi, however, found only in Anelasma. I think your view on the row of hairs on labrum being branchial must be given up; there are thinner but similar hairs on inner *opposed* tunic of sack, together serving as a fence to prevent anything crawling into sack by the sides of the labrum.

Cirri.—The organ you have called palpi, or first cirrus, certainly is the latter, and not much more modified than in Anelasma. The thoracic segment supporting this cirrus is confluent with mouth, and forms the prosoma in normal manner. The *second* (N.B. This is properly the third segment of archetype crustacean.) thoracic segment is large and obscure; the third and fourth very distinct. In one monstrous specimen the fourth segment bore an extra cirrus! showing that the segment is true. The fifth segment small, but quite distinct, and bears the pair of cirri nearest the mouth. The sixth segment, equally distinct, bears the middle pair of cirri. The succeeding and outermost articulated organs are not cirri, but *caudal appendages*. The wonderful little cushion *on* the inner ramus metamorphosed. The caudal appendages are never biramous, and hence have not cushions. It deserves notice that *Alepas cornuta* has the inner rami of the fifth and sixth pair of cirri (and of no other rami) rudimentary, without muscles, and short. These three pairs of organs in Alcippe are all in some respects in an embryonic condition.

Alimentary Canal.—Œsophagus normal; biliary envelope thick and irregular, as in Anelasma; rectum and anus *none*. I am

positive of this latter fact, and it is the most curious point in the anatomy of the genus. Alcippe must *always* eject (as other Cirripedes sometimes do) its excrement from the mouth.

Acoustic and olfactory orifices as in Ibla. Eye not discovered. Nervous system hardly examined.

Female Organ of Generation.—All quite normal, as described under the Lepadidæ. The ovigerous frœna are very large, and are destitute (as in some species of Pollicipes) of glands; they probably serve as branchiæ, as well as the universally-admitted branchiæ in sessile Cirripedes, of which they are the homologues.

Male organs none except a rudiment of penis in normal position between and on ventral side of sixth cirrus.

I have forgotten to remark that the external parts of animal (capitulum and peduncle) do not *essentially* differ from same parts in Anelasma, though very peculiar.

Metamorphoses.—In first stage I can add only the minute and lower antennæ. Most fortunately I detected some larvæ just before their metamorphosis into Alcippe. They are peculiar in having their prehensile antennæ seated almost at the very end of the quasi-bivalve shell; the abdomen and caudal appendages are peculiar; but they have six pairs of natatory thoracic legs, and in all other respects resemble the pupæ of Lepadidæ.

Male Alcippe.—Almost every female has from one to three or more males attached to her on both sides, externally, near the upper end of the horny shield or disc on the peduncle, in two little bags where I have put a cross.* The male is as transparent as glass; its lower end (answering to the peduncle) is three-lobed, and caricatures the form of the same part in Alcippe; the other part (or capitulum) is flattened, *much produced*, and of nearly the same width throughout, with a *small* orifice at the upper end. Total length $\frac{1}{25}$th of an inch. In the lower part we have an *eye*, and great testes and vesicula-seminalis. In the capitulum we have nothing but a tremendously long penis coiled up, and which can be exserted. There is *no mouth, no stomach, no cirri*, no proper thorax! The whole animal is reduced to an envelope (homologically consisting of three first segments of

* Sketch given in letter.

head), containing the testes, vesiculæ, and penis. In male Ibla we have hardly any cirri or thorax; in some male Scalpellums no mouth; here both negatives are united. I know it to be the male of Alcippe from absolute identity of the pupæ of both sexes and other reasons. I believe the males occur on every female. In one case I found *twelve* males and two pupæ on point of metamorphosis permanently attached by cement to one female!

Excavation of Burrow.—The outer skin, and even the whole thickened edge of the orifice into the sack, with its strong sharp spines, is periodically and often moulted. There is a great difference in the state of the star-headed spines on the *new* underlying and the *old* worn spines on the old membrane. This being the case, and there being good motive power in the long and transverse and adductor muscles, I do not doubt the excavation is wholly mechanical. From the position of the larval antennæ, Alcippe after metamorphosis must occupy a position fully as much inclined, or more inclined, than as drawn,* and so would with only little change assume the position which it holds in the shell. Though I cannot demonstrate I can show good reason to believe that it moves its position, when first boring into the shell, just as Lithotrya does, a row of horny discs representing the calcareous overlapping discs in that genus.

With respect to the edging or rim of shell observed by you, it is quite inorganic, and has no more relation to Alcippe than the main part of the supporting coral-reef has to a coral. When dissolved in acid it is found to contain all sorts of rubbish, even of foreign animals. It is a kind of natural mortar.

The rudely radiating dark lines and punctures in the shell *over* the peduncle of Alcippe are formed by a minute Annelid.

Affinities.—I am dreadfully puzzled, and every day change, whether to form a family for its reception, as in one point of view it amply deserves, or to be guided by its varied close affinities to several genera amongst the Lepadidæ and place it in that family. I have never repented in placing Anelasma there; but what to do in this far more puzzling case I cannot yet tell.

I fear my long rambling letter will puzzle and weary you.

* Sketch given in letter.

Accept my very sincere thanks for allowing me to examine this most curious Cirripede, and believe me,

My dear Sir,

Yours very truly,

CHARLES DARWIN.

No. 17.

(No postal date.)

Down Farnborough, Kent,

Feb. 25th.

My dear Sir,

Whenever you have a few minutes leisure I should be very much obliged for answers to two questions, if you can answer them. (1) At what depth is Alcippe found? (2) At about what date was the shell taken which you sent me in spirits with all the specimens of Alcippe. I want to know, because most of the males were well filled with spermatozoa. I fear I wrote to you at too great length in my former letter.

Pray believe me,

Yours very truly obliged,

CHARLES DARWIN.

The dried specimens you sent me by post lately, swarmed with males, but all too dry and shrivelled to do much good with.

No. 18.

(No postal date.)

Down Farnborough, Kent,

March 30th.

My dear Sir,

I am much obliged for your note received this morning, with as full answers as you could send to my queries, and for a former note received some time since with excellent remarks on

the classification of Alcippe. I have been *very* troublesome, but shall cause no more; and am truly obliged for all you have done for me. If in your power I am sure you will kindly in course of summer get me a few specimens for the British Museum and for distribution.

I yet have a few specimens of other Cirripedes of yours in my possession.

I have now finally finished with my South American Boring Cirripede; and this has utterly confounded my previous confusion how to rank Alcippe and it; for they present some most remarkable similarity, for instance, they are both bisexual, with the males remarkably alike, and yet, in what I must consider their fundamental organization, and in their metamorphosis, they are so totally unlike that I cannot place them in the same orders! My classification does not satisfiy myself, nor, I fear, you, if ever you look to my volume on this point.

Pray believe me, my dear Sir,

Yours truly obliged,

Ch. Darwin.

The bosses on the rim of Alcippe are hardish or crustaceous, they are all four opposed to each other, and the little ridges on them are *crenated*. These facts made me suspect that their use was not for simple prehension but for triturating the food; and now I find in my *analogous* South American burrower, and in no other Cirripede, that the œsophagus is provided with the most beautiful discs, set with teeth, and brushes of hairs, worked by muscles, certainly for triturating food, which strengthens my notion.

No. 19.

Down Farnborough, Kent,

Aug. 24th, 1854.

My dear Sir,

You may remember that you gave me permission most generously to dissect all your specimens of *Alcippe lampas*, which

I obtained by dissolving the shell; but I have one or two in spirits not cut up. Shall I return them? or can you spare them for the British Museum? I may mention that Mr. Bate has found Alcippe off Plymouth. I have some other specimens of yours, not of much value, except one from Madeira.. There is one, however, from Davis Straits, which I know is to be returned. I could return the whole lot by post, without I have to return the bottles. In this latter case is there anywhere in London where parcels collect for you?

Allow me to thank you cordially and truly for the very great pleasure I derived from examining *Alcippe lampas*, which is described in full in my volume, now printed, and I presume soon to be published by the Ray Society.

I have also discussed the excavating power of Verruca, which subject I owe entirely to you.

As there are several specimens of the Oxynaspis from Madeira, I have ventured to take two or three to give to Museums. With my sincere thanks, and with much respect,

I remain, my dear Sir,

Yours sincerely,

CHARLES DARWIN.

No. 20.

(No postal date.)

Down Bromley, Kent,

May 25th.

My dear Sir,

I am really very much obliged to you and Mr. Storey,* and am quite ashamed at having caused so much trouble, but I was very curious to obtain this information. My present work leads me to wish to get as accurate information as I can on what some call the economy of nature, and the point in question seemed to me deserving of attention, as aiding in shewing how far the struggle with other species checked the extreme possible

* John Storey, F.B.S.E., was a careful and accomplished botanist, and formerly Honorary Secretary of the Tyneside Naturalists' Field Club.

northern range of any species. It seems odd that dwarfing should be so frequent on mountains, and so rare, or at least not equally conspicuous, at the extreme northern lowland limits of a species.

I hope that you will be so kind whenever you see Mr. Storey to present to him my sincere thanks for all the trouble he has so kindly taken for me, and pray believe me,

My dear Sir,

Yours very sincerely,

CHARLES DARWIN.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ BY THE PRESIDENT, G. H. PHILIPSON, ESQ., M.A., M.D., D.C.L., F.R.C.P., AT THE THIRTY-NINTH ANNIVERSARY MEETING, HELD IN THE MUSEUM OF THE NATURAL HISTORY SOCIETY, NEWCASTLE-UPON-TYNE, ON THE 19TH MAY, 1885.

LADIES AND GENTLEMEN,—For the second time, by your kindness, I have been placed in the honourable position of President of the Tyneside Naturalists' Field Club. For the distinction, which I appreciate, I beg to offer my grateful acknowledgments.

In fulfilment of the duties appertaining to the office, the proceedings of the several Field Meetings will be recounted. In consequence of urgent professional engagements I was not able to attend the meetings arranged to be held at Alston and Wensleydale. I am indebted for the notes respecting these meetings to our much esteemed Honorary Secretary, Mr. Richard Howse. I have also to express my obligations to that gentleman for other valuable assistance in the preparation of this address.

The FIRST FIELD MEETING of the season was arranged for Chollerford, Chesters, and Hexham, and was held on Friday, May 30th. The members, numbering about sixty, and several ladies, left Newcastle with the North British mid-day train, and

on arrival at Chollerford, the Rev. Dr. Bruce, a former President, very kindly undertook to conduct the party over the Roman station of *Cilurnum*, where, by the kind permission of the venerable owner, John Clayton, Esq., F.S.A., they were enabled to see not only the well-preserved remains, the records of the Roman occupation of England, but also the excavations that were being proceeded with. Dr. Bruce, with his usual care, directed attention to the relics, and explained their purpose. His remarks on the gate-ways and the forum were particularly interesting, and elicited the admiration of the party. The new discoveries, he said, had been made while carrying a drain from the older excavations to the river. He had been asked to explain the character of the buildings which had been brought to light, but he said he could not, as the purpose for which some parts of the structure had been used had not been determined. There were seen the remains of a large room with a stone floor, in which, at one end, were seven recesses, like stalls in a church. What these were for has not as yet been ascertained. They stood, however, next to a room beneath which had been a furnace or hot air chamber for warming the building, and the hot air was brought through pipes into the room, a process which is now being adopted as one of the best methods and latest improvements in the mode of heating houses.

The outline of the station of *Cilurnum* is still distinctly visible. It has the peculiarity of possessing two gateways, on the eastern and western ramparts, in place of one, which is the usual plan of Roman stations. This exceptional circumstance seems to be connected with the fact that the wall does not come up to the northern ramparts, but to the southern point of its principal eastern gateway, and takes its departure for its western, so that about one-third of the station projects beyond the wall. It is conjectured that it was originally one of Agricola's camps, formed to protect the bridge, and that when Hadrian made use of it as one of the stations of the wall, he brought up the wall to the southern jamb of the two northern gateways, walled them up, and made use of the smaller ones to the south of them. These ruined walls are the favoured habitat of many wild plants, of

great beauty and of some rarity, of such may be specially mentioned the Yellow Fumitory, a beautiful flower.

The Antiquity House, in the garden of the Chesters, was subsequently visited, when the valuable collection of Sculptured Stones, found in the excavations on the estate, were examined with much interest. Two beautifully-carved life-size figures, representing Cybele and Victory, were seen. A finely-carved Corinthian Capitol was also explained. Among the altars Dr. Bruce drew particular attention to one which bore the inscription "To the ancient gods." This altar he instanced as evidence that Christianity prevailed in the North of England during the Roman occupation. He believed that several of the Romans embraced the new religion, while others, who refused to accept the new faith, raised altars to the "ancient gods."

Previous to passing out of the beautiful grounds of the Chesters, on the motion of your President, hearty votes of thanks were accorded by acclamation to Mr. Clayton, for his kindness in allowing the members and their friends the privilege of visiting the Roman station, and to Dr. Bruce, for having acted as guide, and for his lucid explanation and graphic description of the antiquities.

Afterwards the naturalists walked by way of Walwick Grange, Warden, and Tyne Green to Hexham, and on the way were delighted with the many beautiful views of the North Tyne, the junction of the North and South Tynes, and of the Tyne Valley proper. The foliage of the trees was in great beauty, and the forwardness of the Oak, in comparison with that of the Ash, was a subject of interesting discussion, as to the occurrence being a portend of a dry summer. The surmise proved correct, for the rainfall of the summer of 1884 was remarkably small. The total rainfall for the year 1884, as recorded at the Literary and Philosophical Institution, Newcastle-upon-Tyne, was 20·62 inches, against 27·34 in the year 1883, and 29·38, the average, during the decade just ended.

An excellent tea was provided at the Royal Hotel, Hexham, to which full justice was done. The usual meeting was afterwards held, when five new members were duly elected. Mr.

Thomas Thompson, our much-respected Honorary Secretary, exhibited a nest and eggs of the Hawfinch, *Coccothraustes vulgaris*, taken on May 29th, 1884, at Winlaton. The nest was built about fifty feet from the ground, in the higher branches of an Oak. It was the second occasion for this to be noted. The first was on May 23rd, 1884, near to the same place. The occurrence of the Hawfinch breeding in the county of Durham has never before been recorded. I have since been informed by Mr. Thompson that he has in his collection a nest of the Hawfinch, which was taken near Riding Mill, in May, 1884. The nest was built upon a Pear tree, about five feet from the ground, on a horizontal branch, and about nine inches from the bole. The friend who sent him the nest saw one of the parent birds sitting closely on the nest on the 9th of May, 1884. A week later the eggs were broken and deserted. Mr. Thompson believes that this is the first occasion of the Hawfinch having been observed breeding in Northumberland. Mr. John Hancock, in his "Catalogue of the Birds of Northumberland and Durham" gives the following description of the Hawfinch. "This is a rare casual visitant. Selby states in his Catalogue that 'a few years ago he saw one at Alnwick Castle, which was killed at Hulne Abbey, and that two specimens were some time ago shot near Stockton-on-Tees.' I have three examples which were shot at Streatlam Park, one many years since, and two, a male and female, in the winter of 1837. Several specimens were seen near Belsay Castle in 1860 and 1862. In the former year three of them were shot, and one taken alive. This beautiful species is not known to have bred in either county."*

After a short visit to the Abbey Church, where the crypt was specially visited, the members returned to Newcastle, and arrived there at nine o'clock, all much delighted with their visit to one of the most beautiful and interesting spots on Tyneside.

The Second Field Meeting was held at Alston, for Cross Fell and Hartside, on Wednesday and Thursday, the 25th and 26th

* Natural History Transactions of Northumberland, Durham, and Newcastle-upon-Tyne, Vol. VI., p. 51.

of June. The weather proved favourable, but the number of members was not so great as on the former unsuccessful visit in 1880. On the arrival of the first train from Newcastle the party proceeded in conveyances through Garrigill Gate, and along the rough mountain road that leads by the Cashwell mine and the ruins of the old Cross Fell mine to a mining shop just below the north-western escarpment of the mountain. Advancing by this route, after arriving at the top of the ridge, above Garrigill, which forms the eastern slope of Rotherhope Fell, the incline of the road is so gradual that you ascend almost imperceptibly from a height of 1,800 feet to within about 500 yards of the top. The highest part of Cross Fell is 2,892 feet, but the road is so rough during the last part of the drive, and so perched on the side of a hill, that most of the party preferred walking to being, perchance, toppled down to the level of Cashburn. Arrived at the head of Drypot Burn the horses and drivers were rested in the stables of an old mining shop, and fortunately here we also secured a guide, who was not unwilling to do the honours of leading the party to the top, and shewing the views, or some of them, that are to be seen from this summit. The last part of the ascent was, notwithstanding the pure invigorating breeze, a tough one for untrained town pedestrians, whose smoke-dried lungs hesitated for a while to admit such pure ethereal ozone. On reaching the top, above the Gentleman's Well (a pure spring of the coldest water, even in summer), only a very flat table land, desolate and unattractive, presented itself. Each one having followed the course he thought easiest to the top, on reaching the summit the party was considerably divided, but having been again collected together, the guide led the way to the western edge of the Fell, where there suddenly broke on the view one of those almost unbounded panoramas that are beyond description and detail. On this occasion, though the breeze at the western side was so strong as to almost lift the explorer from the ground, yet the far western distance was obscured in an undefined haze, and as the time did not allow of waiting for clearer evening rays, the landscape was viewed from all sides, and the length and breadth of the dreary flattened top of the Fell was traversed, only a few Golden Plovers

being disturbed, their melancholy note being in full accord with the place. After bidding farewell to those of our party who intended to travel westwards, and after looking down the initiatory valley of the Tees, we turned our faces to the north and east, to our companions and conveyances far below, and getting a few plants of the Cloudberry as we descended we soon bid adieu to this lonely desolate mountain top, cheerless in its isolated barren loneliness. The view immediately north of the Fell is not without beauty or interest, bounded as it is on the west by ridges rising more than 2,000 feet, forming the highest part of the Pennine escarpment, with a deep basin scooped out to a great depth below, and traversed now by two small streams, Drypot and Cashwell Burn. These unite at Cashwell Force, and form Black-burn, which cuts its passage deeply between the Fells, and joins the Tyne before reaching Alston. In looking down this basin in summer time, two or three bright green mounds are seen amidst the dark peaty, heathery moorland, Bulman's Hill and Lambgreen Hill, oases, as it were, in this desolate waste. They are isolated patches of limestone covered with short grass and other plants which delight in a limestone soil. Those who have been deputed to examine these rocks have been unable to explain how they happen to be so placed. At the foot of the Cashwell Burn a large vein or dyke occurs, filled in some places at least with iron pyrites, and named by the local geologists, the Great Sulphur Vein, or Miners' "Backbone of the Earth." In our excursions we could not see distinct features of this on the surface, though we must have crossed the line of the dyke, which is supposed to disperse itself on the Yad Moss. A theory, sufficiently startling to incite some of our younger members to investigate the accuracy of the suggestion, has lately been broached that the "igneous dyke" known as the Cockfield Dyke actually extends from the neighbourhood of Scarborough to the River Eden, at Armathwaite, crossing between these points over Yad Moss, portions of the counties of Durham and Cumberland. We could see no indication of this dyke on our road to and from Cross Fell, nor could we trace any dyke in a former examination of the Black-burn, from its foot upwards to Cashwell Burn.

The flowering plants gathered on this visit were of the same species as those recorded on our former excursion in 1880. After enjoying the delightful drive back to Alston the party dined at the Blue Bell, and had a long stroll in the evening through the town, or rather up the hill side on which the town is built.

It was intended on the second day to ascend by the Penrith road to Hartside, and the high part of Gildersdale, but the heavy clouds resting on the fells induced the party to confine their excursion to the valley, and after breakfast the members proceeded in conveyances to Whitley Castle, a Roman station on the Maiden Way, a road which is now in many parts difficult to trace, but in olden times was used as a military road, extending from Greenhead, on the Tippalt, across Melmerby Fell (2,000 feet), to Kirkland and the Eden Valley. Before reaching the Castle permission was obtained to examine a Roman Altar standing in a garden by the road side, but it was found to be so much defaced that it is impossible to give any particulars respecting the inscription. The mound on which the camp is situated is surrounded with five or six very deep trenches on the west side. The eastern and south side form a steep escarpment towards the valley. The interior is of considerable extent, but is crossed by a modern stone wall, which spoils the view. Looking south from the camp the Roman road or track was seen crossing the side of Gildersdale Forest in an oblique direction. The weather improving the party strolled over Whitley Common, and then along the Thornhope Burn to Slaggyford, a hamlet on the South Tyne, whether so named from the frequency of slag on the sides of the neighbouring fell we know not. The Globe Ranunculus was still in fine flower, and many of the Orchids were also in rich bloom, in these upland dales, and the Hawthorn was in rich luxuriance by the roads and streams. After an early dinner the party walked to the Nent Force, and then to the railway station. Leaving Alston and fine evening sunshine the gloom and heavy rain of the lower Tyne was soon encountered. The recollections, however, of Alston and Cross Fell are too strong to be soon forgotten.

The Third Field Meeting was arranged for Low Row, Coome Crag, Birdoswald, and Gilsland, and took place on Wednesday, July 16th. An early party, numbering six members, left Newcastle by the first train for Low Row, where breakfast was provided at the Railway Inn, adjoining the station. The unsettled weather in the early part of the week, no doubt, influenced the attendance of the members at this meeting. After breakfast, through the kind permission of the directors, Carrick's Cumberland Dairy Farm was visited, and the party spent considerable time in inspecting the processes of separating the cream from the milk, the churning and butter making, the manufacture of cheese from skimmed milk, and lastly the pig farm, where the whey, left after the cheese making, is utilised for fattening swine. The contrast between the processes used at this model dairy farm and those manual operations carried on formerly, and even at the present time, in the most celebrated cheese-making districts of the South of England were very striking. But whether machinery or manual dexterity produce the best quality of cheese and butter is perhaps a problem not so easy to solve as the question of quantity in a given time. A very pleasant walk soon led us to the side of the river Irthing, swollen and turbulent, and more the colour of London porter than any other fluid. We crossed at Wall-holme by a substantial wooden bridge, and then along the winding banks, which became steeper and narrower, and densely wooded, as we ascended the stream. This part of the stream is most romantic and unique, and must be seen to be fully appreciated, for no one looking over this portion of the Irthing Valley, from a distance, would realize the appearance and depth of the river bed as viewed in the vicinity of Coome Crag. At this place the swollen state of the river obliged the party to quit its banks, so we struck up through the fields and across the Roman earthworks or vallum, which form a conspicuous feature to the south of the line of the wall. At Birdoswald we were met by a second party, including several ladies, who had travelled by a later train to Rose Hill station, and who had walked by Hill House. The whole party were courteously allowed to inspect the Roman station of *Amboglanna*, also the antiquities

preserved in the farm-house of Birdoswald. *Amboglanna* is the twelfth station on the line. It is the largest of all the stations. The walls of the station show good masonry, and are in a good state of preservation. It presents one of the finest specimens of a camp. The gateways show the sockets, where the hinges moved, and the grooves worn by the wheels. The prospect from the station, both to the north and the south, is very striking. The late Earl of Carlisle, in his "Diary on Turkish and Greek Waters" (p. 87), says, "Strikingly, and to any one who has coasted the uniform shore of the Hellespont, and crossed the tame low plain of the Troad, unexpectedly lovely is this site of Troy, if Troy it was. I could give any Cumberland borderer the best notion of it by telling him that it wonderfully resembles the view from the point just outside the Roman Camp of Birdoswald; both have that series of steep conical hills, with rock enough for wildness and verdure enough for softness; both have that bright trail of a river creeping in and out with the most continuous indentations: the Simois has, in summer at least, more silvery shades of sand."*

Looking towards the north-west, from the road skirting the north-west of the station, a tower-like object is seen; it is a fragment of the walls of Triermain Castle, an old "Peel" building celebrated by Scott in his "Bride of Triermain."

After a most pleasant walk to Gilsland, the Spa was visited. From the foot of a shale and sandstone cliff, about one hundred feet high, the sulphur stream bursts in a full gush of clear sparkling water, a few feet above the bed of the river Irthing. The banks of the Irthing in the immediate vicinity of the Spa are bold and rocky. The Yellow Saxifrage, *Saxifraga azoides*, which grows on the cliffs in considerable abundance, was much admired.

Gilsland occupies one of the highest table lands between the Irish Sea and the German Ocean. It is the most northern of the English Spas, and is situated near the line of separation between Northumberland and Cumberland, in the latter county. Gilsland, independent of its other merits in regard to scenery

* Bruce's Wallet Book, p. 184.

and associations, derives interest from having been the spot where Sir Walter Scott first encountered his bride, the youthful and beautiful Miss Carpenter, then residing at the Spa, and accordingly in his works he has repeatedly referred to the romantic banks of the Irthing. The scenes and incidents of one of the most interesting portions of "Guy Mannering" are laid in the immediate vicinity of Gilsland.

An excellent dinner was partaken of at the Shaws Hotel. The proprietor, Mr. Geldert, was most assiduous in his attentions to the members. After electing four new members the party walked leisurely to the train at Rose Hill, the bright sunshine and balmy western breeze enhancing their enjoyment of the scenery of this charming neighbourhood.

The Fourth Field Meeting was fixed for Leyburn and Wensleydale, and was held on Monday and Tuesday, August 4th and 5th. Several of the members availed themselves of the opportunity of extending their visit from the previous Saturday, by taking the excursion ticket furnished by the North Eastern Railway Company. About twenty members were present on the Monday morning, most of whom arrived at Leyburn on the Saturday evening previously, thus both avoiding the early start on the Monday, and enjoying the invigorating mountain air and the varied scenery in Uredale for a day or two longer. The party were comfortably entertained at the Bolton Arms, Leyburn, during their excursion. On the first day, under the guidance of Mr. William Horne, the party drove through Harmby to Spennithorne, where they had an opportunity of examining the fine old Church and its monumental adornments, the latter of which were fully explained by the obliging Rector (Rev. J. G. Milner, M.A.) The route was then through East Witton and the new wooded Ure valley to Jervaulx Abbey, admission to view the remains being obtained at the gardener's cottage. On the occasion of a former excursion of the Club to Wensleydale (September, 1876) Jervaulx was visited, and your President, in his address, gave a full account of the remains, so that, upon this occasion, it will be unnecessary to describe them. The party were met at

the ruins by Thomas Maughan, Esq., agent to the Marquis of Ailesbury, and after being kindly conducted to all the interesting portions, were invited to partake of refreshments on the beautiful lawn at his residence in the neighbourhood. Here were also shown a fine specimen of the Saw Fly, *Sirex gigas*, which had been recently captured in the neighbourhood; and many fine specimens of plants were reported as growing on the abbey remains. Retracing the road to East Witton, the members proceeded along a lane, so extended and narrow that they were glad to find that it was not much traversed by vehicles, and were thankful when they emerged on a broader road near the entrance gateway to Coverham ruins. These are truly neglected and uncared for. It was strange to see, at the back of the farm house, massive effigies of Crusaders and Knights Templars, and other monumental covers arranged like a rockery along the side of a brick wall. These heroes came no doubt to die in peace, after years of warfare and bloodshed, into this secluded dale and quiet home, never dreaming that future strife would destroy their chosen resting place. The contrast between Coverham and Jervaulx, even in their ruins, must leave a melancholy reflection on the visitor; and glad to escape from such thoughts the members soon breathed the free fresh air of Middleham Moor, with its extensive views, and felt thereby cheered with happier suggestions. Before arriving at Middleham, our fellow-member, Mr. Thomas Arkle, directed the attention of the party to an elevated mound in a field north of the road and of Middleham Castle. This earthen mound is surrounded by a deep ditch, and there is a deep hollow in the top of the highest part, and also in a lower adjoining part of the hill. Mr. Arkle is of opinion that it has been used for the same social purposes as the Mote Hills of Elsdon and other places in Northumberland, and dates from an early period of our history. The view of Middleham Castle from this mound was very grand; its bare grey walls, massive and defiant still, were a fine contrast to the rounded and softened outlines of the distant and intermediate features of the landscape. A pleasant drive to Leyburn brought to a close a very enjoyable excursion.

After dinner, a hearty vote of thanks was passed to Mr. Maughan, who had kindly conducted the party through the ruins of Jervaulx, and to Mr. Horne, for his kind assistance and guidance during their visit to Wensleydale.

On the following day, those who were able to remain made an excursion by Scarth Nick to Bolton Castle, and afterwards visited Aysgarth and its waterfall, returning through West Witton to Leyburn. The fine weather, and the buoyant mountain air of this mountain valley, were much enjoyed by all.

The Fifth Field Meeting took place at Loftus and Staithes, in Yorkshire, and was held on Monday, September 22nd. The members left the Central Station, Newcastle, by the 7.35 A.M. train, and travelled *via* Ferryhill, Middlesbrough, and arrived at Loftus at 10.40, where they were joined by others, who had left Newcastle on the previous Saturday, and had spent the Sunday at Saltburn-by-the-Sea. After partaking of a slight refreshment, and a short stroll through Loftus, the party started for the Coast line, and were most ably conducted by Dr. Veitch, of Middlesbrough, the Honorary Secretary of the Cleveland Naturalists' Field Club, whose knowledge of the locality, as well as of its geological features, was of the greatest value. The weather was remarkably fine for the late season. On our route to Hammersea, we noticed by the roadside, at an elevation of 400 feet, a fine boulder of Shap Granite, or Wastedale Porphyry, as it is more generally designated. In the central valley of the Tees these boulders are rather abundant, but are more sparingly distributed in the Cleveland district. Locally no erratic blocks are of greater interest than those brought into our district from Shap Fell. After being carried by some means across the Stainmoor ridge, they have been carried through most of the Yorkshire valleys draining into that river into the valley of the Tees. On reaching a lower part of the Tees, their course seems to have been directed south, along the line of the Ouse Valley, as far as the Holderness of Yorkshire, and a few are said to be spread over the Cleveland area.

As time did not permit to follow the base line of the cliffs our

path led above the Loftus old alum works to the highest part above Rockcliff, and along the edge of precipitous cliffs, which went sheer down more than 500 feet. The highest part of Rockcliff is estimated at 680 feet, but the coast edge is somewhat less. It was easy to distinguish, from above, the thick yellowish beds of the Lower Oolite which here covers the Upper and Middle Lias, the latter having been worked formerly for ironstone nodules, and the former for alum shale. The debris left at the foot of the cliffs forms enormous heaps, which would no doubt repay the search of the fossil collector. The alum works have now been abandoned, both at Loftus and Boulby, and the buildings are fast falling into decay. The views from the highest part of the cliff were panoramic, and novel to most of the party. The extensive sea view, with its steamers, much diminished in size from this lofty headland; the range of the coast, north and south; and the mass of the Cleveland hills, formed scenes long to be remembered.

From Boulby we quickly descended to Staithes, and entered that secluded fishing hamlet by a road leading down the side of the steep bank of the Rousby Beck, which flows into the sea through a deep-cliff cutting or chasm. We arrived punctually at the Black Lion Inn in time for a comfortable dinner. Afterwards we strolled through this quaint village, to fraternise for a time with the hardy men who call Staithes their home, but who really live more on the open sea than on land. Independent and outspoken men they are, temperate, and truthful and trustworthy; and thoroughly inured to hard labour and frugal fare from their earliest years; but sharp in selling fish and making a bargain, but quite willing to sell as many fossils as they had at a moderate price. After completing a few bargains of this kind, we were obliged to proceed to the train, travelling through the richly-wooded valleys which lie within and are sheltered by the lofty coast line of North-East Yorkshire to Middlesbrough and Newcastle.

The Sixth and last Field Meeting of the year took place at Seaton Delaval and Blyth, on Monday, October 6th. The

morning was rainy and very unpromising, yet eight members and friends assembled at the New Bridge Street Station, and left by the 11.15 train. Several left the train at Seaton Delaval station, and proceeded by Delaval Avenue and the Links to Blyth. The rest travelled direct to Blyth, and after having with some difficulty found a place where tea could be provided, crossed the river Blyth in the ferry boat, and then rambled quietly along the coast to Cambois Colliery. Here they were obligingly joined by Mr. Thomas Forster, viewer of the colliery, who was fully prepared to accompany any of the party who might wish to descend the pit, and see the method of working coal. But it was decided to avail ourselves of Mr. Forster's kindness to see the machinery and the method of hauling the coal to bank, and in this manner a very pleasant hour was spent. Through Mr. Forster's kindness the party were brought back to Blyth on one of the colliery locomotives. They then viewed the operations of the River Blyth Commissioners in the deepening of the channel, with which they were much gratified. After tea, a hearty vote of thanks was accorded to Mr. Forster for his kindness in making the visit to Blyth and Cambois so agreeable.

During the year the Club has lost by death one of its original members, the Rev. John Frederick Bigge, M.A., Vicar of Stamfordham, Northumberland. He died, after a short illness, on February 28th, 1885. He took an active part in the formation of the Club, in the year 1846, and was one of its first Vice-Presidents. The first Field Meeting of the Club was held at Ovingham, on May 20th, 1846. At this time Mr. Bigge was Vicar of Ovingham. He acted as guide to the Club on the occasion, and was aided by his curate, the Rev. Walter Featherstonhaugh, now Rector of Edmondbyers. He was President of the Club in the year 1847–48. The particular branch of Natural History to which he devoted himself was Botany. He was a member of the Sub-Committee of the Club for the preparation and publication of the Catalogue of Botany.

He contributed the following papers to the Club, and which were published in the Transactions:—

Notices of Remarkable Trees of Northumberland. Vol. IV., p. 35.

Ancient Stones, inscribed with Concentric Circles, found in the Parish of Stamfordham. Vol. IV., p. 330.

Notes on Newbrough and its Neighbourhood. Vol. V., p. 5.

Meteorological Notes. Vol. V., p. 25—205.

Local Superstitions at Stamfordham. Vol. V., p. 88.

In addition to his taking a lively interest in the Berwickshire Naturalists' Club, and the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne, of which Society he was a Vice-President, he was one of the Honorary Curators of the Museum of the University of Durham, and had been so from his undergraduate days.

His knowledge of old Northumbrian traditions was great. He was also no mean naturalist. A country walk with him was always interesting, for the quickness with which he marked any of the less familiar birds or animals which might chance to cross the path, and for the accurate botanical knowledge he brought to bear upon the plants and flowers which adorned the pathway, through a field, or the banks of a country lane.

A brief reference may now be fitly made to the important event, the completion of the new Museum of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne. The noble building was opened by His Royal Highness the Prince of Wales, on the occasion of his memorable visit to the Tyne, on Wednesday, August 20th, 1884, when he was accompanied by the Princess of Wales and his two sons, the Princes Albert Victor and George.

The accomplishment of the great undertaking would have been exceedingly difficult but for the munificent contributions which have been given by a few liberal and wealthy friends of the Society. The Building Committee are to be heartily congratulated upon the success of their efforts. The well-arranged building is admirably adapted to accommodate and display the valuable typical collections.

It is only proper to say, for the conception and the carrying out of the undertaking, naturalists generally are indebted to Mr. John Hancock. More important than this, is the munificent gift

of that gentleman to the Society of his own splendid ornithological collection. The setting up of these birds is the work of his own hands, and whether they be regarded in a scientific or an artistic point of view, they are equally unrivalled.

The Berwickshire Naturalists' Club visited Newcastle, on Wednesday, September 24th, 1884. On that occasion your President, Col. J. R. Young, John F. Spence, Esq., and your Honorary Secretaries, were appointed by your Committee as a deputation to meet the members of the Berwickshire Club. The place of meeting was the Museum of the Natural History Society, and the party were welcomed by the late Rev. J. F. Bigge, representing the Natural History Society, and your President, on behalf of your Club. After minutely inspecting the various collections the members proceeded to the Armstrong and Jesmond Parks, and afterwards to the residence of Charles Murray Adamson, Esq., at Crag Hall, where they were most kindly received, and also had the opportunity of examining that gentleman's valuable collection of Birds Eggs and other branches of Natural History. At the dinner, held at the Turf Hotel, several of our members joined the Berwickshire Naturalists, and passed a very enjoyable hour, under the pleasant and genial influence of the President, Capt. Norman, R.N.

The most important publications, relating to Natural Science, which have been issued during the year, are further volumes of the "Report on the Scientific Results of the Voyage of H.M.S. *Challenger*." The Report (Vol. VI.) on the Tunicata, by Prof. Herdman, is a very complete account of the entire group. The first description of an Ascidian we owe to Aristotle, who gave all the more salient points in the anatomy of these animals. After Aristotle, Pliny and Ælian were the only authors who mentioned them, for no less a period than fourteen hundred years, when they were again described by Bellonius and Rondeletius. After this period the group of the Tunicata attracted the attention of many naturalists, and the names of Gaertner, F. O. Muller, Savigny, C. Schmidt, Huxley, Joshua Alder, and Albany Hancock, will be familiar, as observers who have added considerably to our knowledge of their forms.

The discovery of cellulose in the test by Karl Schmidt has destroyed one of the points of diagnosis between plants and animals that was formerly much relied upon. The cellulose is chiefly contained in the outer tunic. The inner tunic is composed essentially of connective and muscular tissue.

The *Challenger* Expedition obtained simple Ascidians in all of the seven great areas into which the seas of the globe have been divided, and further, it ascertained that they were much more abundant in the Southern Pacific Ocean, including the Australian region, than elsewhere.

The Report (Vol. VII.) on the Spheniscidæ, or Penguins, by the late Dr. Morrison Watson, is very interesting. The Penguins have received a considerable amount of attention at the hands of naturalists. Cuvier, Meckel, and Owen have each given good descriptions of their osteology. Reid, Coves, and Gervais have published monographs upon one or more species, but none of these compare in fulness to the present memoir. The vertebral column in the dorsal region is remarkable for the resemblance of the vertebræ to those of reptiles in being opisthocælous, that is in the anterior surface of the bodies being globular and rounded, whilst the posterior are deeply concave, so that the convexity of each vertebra is received into the concavity of the vertebra next preceding.

Dr. Watson finds this peculiarity confined in birds to the Auks and Penguins. The scapula is of relatively larger size than in any other group of birds. He notices that the characteristic feature of the wing of the Penguin as a whole is to be found in the great amount of compression exhibited by all the bones of which it is composed, a flattening that is probably due to the alteration of its functions, for in these birds the power of flight is lost, but the wing is converted into a paddle, which serves the purpose of propelling the bird through the water.

The Report (Vol. IX.) on the Foraminifera), by Henry Bowman Brady, Esq., F.R.S., a former President of our Club, is very complete. It will be universally acknowledged that the task could not have been intrusted to abler hands.

From Mr. Brady's large acquaintance with the multifarious

forms to be met with in the group, and with its literature, he has been enabled to treat in a full and able manner the subject of the classification of these forms, and has thereby developed this report into an elaborate monograph of recent Foraminifera.

With reference to the subject of nomenclature, the following are Mr. Brady's views, which seem founded on common sense. It is surely not requisite, in a group like this, "that a uniform standard of fixity of characters should be adopted, or that a set of beings of low organisation and extreme variability should be subjected to precisely the same treatment as the higher divisions of the animal kingdom. The advantages of a binomial system of nomenclature have not diminished since the days of Linnæus, though the views of the naturalist as to what constitutes a 'genus' or a 'species' have changed, and will probably continue to change, but, be that as it may, the Linnæan method is too simple and convenient to be abandoned without some better reason than the different value of these terms as employed in different zoological groups." "The practical point upon which all are agreed is that it is impossible to deal satisfactorily with the multiform varieties of Foraminifera, without a much freer use of distinctive names than is needful, or indeed permissible, amongst animals endowed with more stable characters." All who have had any experience of the life-history of these Rhizopods, who know their immense plasticness, and yet who remember their, within certain limits of deviation, fixedness of type, will cordially agree with this.

In bringing this valedictory address to a conclusion, it is very pleasing to be able to congratulate the members upon the continued prosperity of our Club. The roll numbers over 550 members. The finances, also, owing to the care and vigilance of our much valued Treasurer, are in a very satisfactory state. That such may be long continued is our ardent desire. Most sincerely do we wish our Club every success, in the future, in its valuable and pleasurable labours. My grateful thanks are again tendered to the members for the enviable position in which they were pleased to place me, when they elected me for the second time President of the Tyneside Naturalists' Field Club.

The following lady and gentlemen were elected members of the Tyneside Naturalists' Field Club during the year 1884:—

At the Anniversary Meeting, May 23rd, 1884:—Messrs. Jaymer Batalha Reis, 53, Grey Street; R. G. Forth (Messrs. Finney & Co., Mosley Street); W. E. Beck, Slate Yard, Gallowgate; Nicholas Strangeways, 59, Westmorland Road; R. D. Teacey, Moor View, Newcastle-on-Tyne.

At Hexham, May 30th:—Rev. Edward Thornton, Low Fell, Gateshead; John Burdon, Esq., Durham; Messrs. John Moult, 3, Gladstone Terrace, Gateshead; Edw. T. Garwood, Southgarth, Westoe, South Shields.

At Gilsland, July 16th:—Miss Fanny Nichol, 15, Portland Terrace; Rev. E. C. A. Forster, Belle View Terrace, Newcastle; Messrs. Hugh Kirton, Waldridge Colliery, Chester-le-Street; Benjamin Tyzack, North Shields.

The Field Meetings for 1885 were arranged to be held as follows:—

May 29th	Blaydon Burn, Spen, and Rowland's Gill.
June 24th—26th	Askrigg and Hawes.
July 17th	Warkworth.
August 3rd (Bank Holiday)	Twizell House and Belford.
September 17th	Redcar and Saltburn.
October 9th	Holywell Dene and Hartley.

THE TREASURER IN ACCOUNT WITH THE TYNESIDE NATURALISTS' FIELD CLUB.

FROM JANUARY 1ST TO DECEMBER 31ST, 1884.

Dr.		£	s.	d.
1884.				
Jan.	To Balance brought forward	189	14	10
	,, Subscriptions	48	13	0
	,, Sale of Transactions	3	2	2
		£241	10	0

Cr.		£	s.	d.
1884.				
Jan.	By Commission for collecting Subscriptions.....	2	8	6
	,, Expenses of Evening Meetings..	0	9	3
	,, Postage	0	16	10
	,, Printing Transactions	75	6	0
	,, Cost of Plates, &c.....	32	5	6
	,, Journal, Circulars, &c.....	23	6	0
	,, Secretaries' Expenses	11	19	0
Dec.	,, Balance.....	94	18	11
		£241	10	0

1885, May 15th.—Examined and found correct,

T. P. BARKAS.

The following gentlemen were elected officers of the Club for the year 1885–86:—

President.

Henry C. Abbs, Esq..

Vice-Presidents.

James Clephan, Esq.
D. O. Drewett.
John Hancock, Esq.
John Philipson, Esq.

D. Embleton, Esq., M.D.
Rev. Canon Tristram, F.R.S.
Rev. A. M. Norman, M.A.
Rev. J. C. Bruce, LL.D.
Rev. A. Bethune, M.A.
E. J. J. Browell, Esq.
Rev. R. F. Wheeler, M.A.
Prof. G. S. Brady, M.D.
H. B. Brady, Esq., F.R.S.
Rev. J. E. Leefe, M.A.
Rev. G. R. Hall, M.A., F.S.A.
G. H. Philipson, Esq., M.D.
Rev. R. E. Hooppell, LL.D.
A. S. Stevenson, Esq.

Treasurer.

Robert Y. Green.

Honorary Secretaries.

Richard Howse.
Thomas Thompson.

Committee.

Benj. Barkus.
T. W. Backhouse.
Joseph Blacklock.
T. T. Clarke.
William Dinning.
John Glover.
Rev. J. M. Hick.
William Maling.
Edward C. Robson.
John F. Spence.
John T. Thompson.
Col. J. R. Young.

Auditors.

J. S. Forster.
T. P. Barkas.

XVI.—*The Tyne, The Lort Burn, The Skerne.* By D. Embleton, Esq., M.D.

Of these names the first is that of a river known all over the world, through the talents and enterprise of the dwellers on its banks; the second is that of a watercourse, a tributary to the Tyne, winding its deep, dark way under the streets of Newcastle; the third, a tributary to the Tees, is the small river running past Darlington.

It is interesting to us Northumbrians to ascertain the derivation and import of these names, and the following attempts at their elucidation are now submitted to the criticism of our two Societies.

I. Of the Tyne.

In Great Britain there are two rivers of this name, one separating part of Durham from Northumberland, the other, the Tyne Water, in Scotland, which runs past Haddington, and falls into the North Sea at Tyningham, a little to the north of Dunbar; in addition to these there is the Tynet burn, on the coast of Banffshire.

There are several places, including Tynemouth, in Great Britain and Ireland, into the names of which *Tyne* or *Tyn* enters, namely, Tyneham, at the south-west corner of the Isle of Purbeck; two small places in Somerset called Tynings; Tynedrum or Tyendrum, in the parish of Killin, in Perthshire; Tynron, in Dumfriesshire; and Tynet, in Banffshire, at the mouth of the Spey.

It is doubtful whether Teignmouth and the Teign, in Devon, Teynham, in Kent, and Tean, consisting of Tean and Upper Tean, indicating a separation of parts, in Staffordshire, should be included in the same category with our Tyne.

In Ireland there are Tynach, in Galway, and Tynan, in Armagh.

The consideration of these doubtful names, from want of topographical information, is not here entered upon.

The Northumbrian Tyne, in early British times, separated the so-called Ottadeni on the north from the Brigantes on the south. Its name its not found in the Roman Itinerary, but occurs in Ptolemy's Geographia, thus, '*Tynæ flu Ostia.*'

The following passage from Camden's Britannia, Vol. III., p. 31, touching on the Tyne and the Ottadeni is of considerable interest and value.

"Next to the Brigantes we have in Ptolemy a people whose name is variously spelt; Ottalini, Ottadeni, and Ottadini, for which, if I might presume, I should by an easy alteration substitute Ottatini, *q.d.*, Beyond or Above the river Tine.

"Thus the name of the people will correspond with the situation of their country. For they were settled beyond the Tine, and the Britans to this day call the country in Wales beyond the river Conway, Uch Conwey, beyond the mountains, Uch Mynyth, beyond the forest, Uch Coed, beyond the river Gerwey, Uch Gwyrway. Nor can it be so much out of the way if for the like reason they called this country beyond the Tine, Uch Tine, whence the Romans seem to have formed this name of Ottatini with greater liberty of speech but more agreeable sound."

Camden's alteration of the name is therefore very probably correct.

If the Ottatini were so called from their occupying the Uch-Tine, or country beyond the Tine, this river must have had the name of Tine or Tyne among the Celtic people on its banks, and have been considered by them as a boundary, otherwise the Romans could not have coined the name Ottatini for the people on its northern side, or Ptolemy have put down the name of the river as we find it in his Geographia.

However, neither *Tine* nor *Tyne*, neither *Tain* nor *Ityna*, nor *Tean*, nor yet *Tian*, in the sense of river or of water, is found in any Welsh, Breton, Gaelic, or Cornish dictionary to which I have access. See Ir. and Manx.

In the Celtic dialects, we see in Corn. *uch*, prep. above, over; Wel. *uch;* Arm. (Breton) *uch*, *us;* *uch* being in French *haut*, *élevé;* Ir. *os*, *uas*, *suas*, *soos;* Gael. *os*, *suos*, *achd;* Manx *heose*, *seosé;* Ger. *hoch;* Engl. *high;* Sansc. *ut*.

To these may be added from Cleasby and Vigfusson, "Icel. *hóll*, hill or hillock, and *hár;* Ulph. *hauhs;* Gr. ὑψηλός; A.-S. *héah;* O. H. G. and Hel. *hoh;* Old Frank *hag* or *hach;* Swed. *hög;* Dan. *höj;* all, except the Danish, with a final guttural;" and all meaning high, above, beyond.

In Icelandic *Tína*, to pick, cleanse; *tína grös*, to pick moss (separate it from leaves). Cleasby and Vigfusson.

In Ihre's Suio-Gothic Glossary we find, in the sense of separation, "*Tina*, to thrash corn by beating, to separate the grain from the husk, as *tina sæden*, to thrash out corn; *tina nötter*, to separate nuts from the husk, to cleanse, to separate from the refuse; from Gr. δεῖνειν, percutere; also *Tina*, labrum, a tub for washing; the Prussians call it *tiene*. The word is very ancient; even in Varro *tina* is a large vessel. Hesychius gives the Gr. δεῖνος, for a kind of cup."

In Danish *tina* means to hedge round; there is also *tine*, a prong of a fork. In Swedish *tina* is a tub.

"In A.-S. and the Scandinavian dialects *tún* is a hedged or fenced plot, enclosure; a word widely applied and common to all Teutonic languages." Cleasby and Vigfusson.

"In A.-S. *Tina*, *tine*, *Tyne*, is the river which, after passing by Hexham and Newcastle, in Durham and Northumberland, enters the German Ocean. *Be tinan thœre ea.* Juxta Tinam fluvium, by Tynewater there (Bede); and Tinan vel Tine-muth, Tinmouth; Tinæ fluvii ostium." Lye.

Lye and Bosw., in their A.-S. Dictionaries, say, "*Tyne* is sepes, sepimentum (a hedge), and *Týnan*, claudere, to hedge in."

In Du Cange and Carey's Ainsworth we find *tina*, a large vessel for holding wine, oil, &c., a bowl for drinking out of.

To *tine* the door is to shut it, from *tynan*, to shut. Tines, *harwotinne*, the teeth of a harrow, from the Isl. *tinne*, the diminutive of Gr. τον, *dens*, to which I refer without hesitation the tines of horns. Junius Etymol. Anglic.

Halliwell, among other meanings of 'to Tyne,' gives 'also to divide with a hedge.'

Brockett has "*Tine*, to shut, to enclose. Sax. *tynan*, claudere."

Jamieson tells us that "*To Tyne*, *tine*, v.a., is, 1. To lose,

2. to forfeit, 3. to kill or destroy, 4. to 'tyne the saddle'—to lose all. This term has no affinity to any A.-S. v." But Jamieson wished to have the Scottish dialect accounted a separate language from English.

In Icelandic we find *Týna* (*týón:* Scot. to tyne), to lose, 2. to destroy, put to death. II. *reflex*, to perish. *Týning*, destruction.

This may suit the Scotch of Jamieson, but can hardly be the derivation of the name of our river.

In the Craven Glossary is "*Tine*, to shut, as a door."

In the Northampton Gloss. "*Tine* is to divide or enclose a field. Dut. *tuynen*." In the Tauchnitz Dutch Dictionary "*tuin* is a fence, hedge, garden, and *tuinen*, to garden." In Flemish the words are the same. This *tuin* is the same as the A.-S. *tún*, which implies a house hedged round, and thus separated from all around.

In the Cotswold Gloss. "*Tine*, is to kindle; *Tyning*, an enclosure from a common field; *Tynan*, Sax., to lose, because the common field loses it." That is by its being separated from it.

The village of Freshford, four and three-quarter miles east from Bath, in Somerset, consists of two parts, separated by a considerable pasture or common, which is locally called '*The Tynings*.' "There is another small village on a hill near Radstock, also in Somerset, called The Tynings." T. W. E.

In the Wiltshire Gloss. "*Tine*, is to divide a field with a hedge, from A.-S. *tynan*. Also to light, to tine, a candle."

Horne Tooke takes a wider range than the local Glossaries, as may be seen in the following extract, viz.:—

"*Town*, *Tun*, *Ten* } Notwithstanding their seeming difference these three are but one word, with one meaning, viz., Inclosed, Encompassed, Shut in; and they only differ (besides their spelling) in their modern different application and subaudition. It is the past tense, and therefore past participle (*ton*, *tone*, *tun*, *tyne*, *tene*) of the Anglo-Saxon verb *Týnan*, to Inclose, to Encompass, to Tyne. To Tyne (Skinner says) adhuc pro *sepire* in quibusdam Angliæ partibus usurpatur: si Verstegano fides sit."

In a note, Vol. II., p. 206, from Dr. Beddoes, "To *Tyne* is still a provincialism. To *Tyne* a gap in a hedge, means, at

present, to fill it up. A *tun*, *tunne*, and its diminutive tunnel, *tænel*, is the same participle, with the same meaning." Also in note at p. 207, "*Tina*, *Tinia*, are cognate words, from the same origin, and with the same meaning. Diversions of Purley, Vol. II. 1829.

In French, *Tine*, a kind of tun for carrying water.

The Rev. Isaac Taylor, in 'Words and Places,' New Edition, 1882, p. 138, is inclined to think "that in these names" (among others) "the Tyne in Northumberland and Haddington, the Teign in Devon, the Tian in the island of Jura, the Tean in Stafford, the Teyn in Derbyshire, and the Tynet in Banff, may be found the root *don*.

In a note to the same page he says "Some of these names may be from the Celtic *tian*, running water, or perhaps from *ta-aon*, the still river."

This word *tian*, as already stated, is not to be found in the Celtic dictionaries at my disposal.

The word *Tine*, therefore, must have dropped in byegone ages from the Celtic dialects, but has been preserved, like insects in amber, by the invading and overlapping Anglo-Saxon, Scandinavian, and English tongues.

The Icelandic, Scandinavian, and other languages quoted above have another form, *e.g.*, German *hoch*, which at first sight appears not to be cognate with the Celtic form, *e.g.*, *uch;* but if the aspirate be omitted from the former, and the guttural of the latter retained, the resemblance of the two forms will be sufficiently evident.

The conclusion to be drawn from a consideration of these quoted explanations, which (excluding Mr. Taylor's, which appears too speculative) are all more or less consistent with each other, must be that the river in question was so named because the Celtic people living to the south of it evidently saw that it enclosed or shut in their land, and separated it from that beyond or above it. Now the enclosure of land by a hedge, or other fence, or by water, or anything else, implies the separation of the part enclosed from its environments, and the enclosure is in a sense lost to the open country.

It is more probable that the Romans would get the name of the river from those who occupied the country south of the river rather than from those located to the north of it.

The Tyne then was the enclosing river of the Brigantes, the separating line of water between neighbouring tribes, the Brigantes on the south being Celts, and the Ottatini and Mæatæ on the north being Picts and Scots, though according to some also Celts.

The Romans too must have regarded the River Tyne as such a boundary or dividing line, as we see that it separates Durham and Northumberland in the lower part.

Some hold that the Tyne owes its name to its bifurcation above Hexham into North and South Tyne. Certainly the points of a deer's horn are called tines, as, for instance, 'a stag of ten tines.' The teeth of a harrow are called tines, and the prongs of a fork are called tines; a three-tined fork, is a dung fork so called. "To tine a door, to shut out." Tour to the Caves, 1781, Engl. Dialect. Soc. In each of these three cases there is also implied a separation of parts, and a three or four-pronged dinner fork is sometimes in Newcastle parlance called "a splet spyun," also implying the same.

The previous explanation, however, being applicable to the lower course of the river from the sea to Wylam Station, and to one or other of its branches beyond, as a boundary or separating line, seems preferable.

A railway passenger between Newcastle and Carlisle one day in a very dry summer, observing the small size of the Tyne stream, beyond the influence of the tide, gave it as his opinion that the name of the river must have been given to it because it was so tiny!

II. The Lort Burn.

The *Lort* or *Lork* Burn is a small stream, except in rainy seasons, when it is considerable, which arises from the west side of the town moor, and ran in old times in the light of day, but now runs darkly underground, down Gallowgate, Darn Crook,

the Nuns, under the High Bridge, and the lower part of Grey Street, Mosley Street, and Dean Street, under the Low or Nether Dean Bridge, the Side, and the east part of Sandhill, to the Tyne.

Brand, Vol. I., p. 331, says, "Lort or Lork Burn, up which for a considerable way the tide flowed formerly, made a division anciently in the lower part of the Side. This runner of water was covered over with stone A.D. 1696," and, in a note against that date, states that it "was arched over and paved from the foot of the Side Pant to the Keyside Wall." Grey's MSS., 4to. No. 3 Dorse.

And in Vol. I., p. 29, note, "There is a tradition that the town's waits or musicians stood and played on a small bridge thrown over this Lork Burn, opposite to a house called at present Katy's Coffee House, while Oliver Cromwell was entertained at dinner." This was on the 19th of October, 1648, on the general's return from his expedition into Scotland, and when Thomas Bonner, Esq., Mayor, had been newly elected. Cromwell stayed three days in Newcastle on that occasion.

The name *Lort Burn* is the conjunction of a Scandinavian and an Anglo-Saxon word. *Lort* is Scandinavian, and *Burne* A.-S., both old words; the former having been lost, whilst the latter and more ancient one has been preserved.

In the Suio-Gothic dialect, Ihre, in his Dictionary, lets us know that "*lort* means sordes, stercus, in Aleman *ord* est sordidus, et Gall. *ordure* sordes denotat.

In Icelandic it is *lortr*. Verisimile est nos *l* proposuisse uti id sæpe fieri suo loco docetur. Angli *d* litera in vocem eandem auctiorem redidisse videntur in suo *durt*, *dirt*. Belg. *tort*, *torde*. Ad nos vero quam proxime accedunt Itali, quippe quibus *lordare* est inquinare *lordezza*, immundities, *lorāura*, sordes." Ihre.

Lort does not occur in A.-S., German, Dutch, Flemish, Spanish, or Portuguese dictionaries, but in those of the Danish and Swedish tongues.

It may be concluded that the burn was called Lort Burn first in the Danish period on account of its being the receptacle of filth of every abominable kind, cast out from the backs, and probably

also from the fronts, of some houses bordering on it, and that the name has been perpetuated down to the present day. It is curious that it did not receive the appellation of the Lort Beck.

III. The Skerne.

Like the Lort Burn, the little river Skerne, which runs through the lowest part of the town of Darlington to the Tees, near Croft, has an ancient name, one that has come down from Anglo-Saxon times, but which has nothing Danish or Scandinavian in it, though it has much the same meaning as Lort, and was, in all probability, applied for the same reason.

Scearn, *scærn*, *scern*, or *sciern*, in Anglo-Saxon, means dung, and is derived from *sceran*, to shear, divide, separate, part.

In local Durham dialect *cow-share* is cow-dung.

Skæra in Icelandic means purgare, to purify.

In olden times the inhabitants of most if not of all towns that had the advantage of a stream running through them, availed themselves of its scavenging capabilities, for its current, aided by occasional showers and storms of rain, would from time to time carry off to the river the scearn or lort (or dort, mod. Newcastle) more or less imperfectly; at any rate that part of it which was left by the dogs, pigs, and poultry, which in those days were allowed, except in Plague times, to roam at large through the streets for exercise, and for picking up a part of their daily sustenance—an insanitary condition of municipal affairs well adapted for rendering such towns excellent hotbeds for the generation of fevers, and almost every variety of endemic and epidemic disease, the Plague being the worst.

The modern appellation of the Lort Burn is Sewer, a term scarcely so applicable to the Skerne, as it still runs in the light of day. The Tyne is the separating river.

XVII.—*A Catalogue of Mr. N. J. Winch's Lichens, now in the Museum of the Natural History Society, Newcastle-upon-Tyne.* By the Rev. W. Johnson. December, 1887.

The following list of lichens is part of Mr. Winch's herbarium, and, we regret to say, the only part of his lichen-collection which it is now the privilege of the Barras Bridge Museum to possess. The name of Nathaniel John Winch is well known to North-country and other botanists, by the "Botanists' Guide, etc.," and his "Flora of Northumberland and Durham;" and it is a matter of profound regret that we know so little about the man. Mr. Winch was a zealous student and a keen investigator in botanical science, and that, at a time, when the facilities for such work were much less than at the present; when the science of botany was less advanced, and work must necessarily be more original; and when journeys far into country districts were an arduous undertaking and meant much personal labour and sacrifice. Notwithstanding these, with other concomitant difficulties, Mr. Winch fairly investigated the flora of our two northern counties, and reduced his knowledge and facts to order for the benefit of those who should follow him in the same track. To the authors of the "*Botanists' Guide through Northumberland and Durham,*" and to Dr. G. Johnston, of Berwick, after them, the credit may be fairly said to be due of developing and systematizing north country botany. Before the appearance of the above-named work in 1805, what had been done in the flora of Northumberland and Durham was very limited indeed.

Mr. Winch was a Fellow of the Linnæan Society and an Honorary Member of the Geological Society of London. To the latter Society he contributed a valuable Memoir in 1814, entitled "Observations on the Geology of Northumberland and Durham." See Trans. of the Geological Society of London, Vol. IV. 1816. He was closely associated with the work and objects of the Literary and Philosophical Society, Newcastle-upon-Tyne, as is evidenced by his literary contributions. He was also one of the founders of the "*Natural History Society*

of Northumberland and Durham." Proposals to institute this Society were made in the midsummer of 1829, but it was not organized until the following year; and Mr. Winch, in conjunction with Mr. W. Hutton, are represented as its first Secretaries. Mr. Winch's connection with the Society, we are sorry to say, was not of long duration; the last notice of his presence at its meetings being in November, 1832. The cause of his separation we cannot here discuss; but suffice it to say that it resulted in the whole of his large and valuable collection being sent to the Linnæan Society, and those now in the possession of the Barras Bridge Museum, are only such as have been returned by the authorities of the Linnæan Society, after they had made their selection.

Merit, in a "favourite pursuit," had little claim in the mind of Mr. Winch. If the pursuit was agreeable and loved, then the labour, patience, and perseverance it required were "trivial indeed." That was the spirit in which he regarded and wrote about his own work, and which undoubtedly accounts for the large amount of unrecompensed service which he rendered to botanical science. He was, what every scientist should be, a student of Nature from the love of Nature; he neither changed nor flagged in his delightful pursuit so long as his powers remained. His *Flora of Northumberland and Durham,* published in the Transactions of this Society, Vol. II., Part 1, 1832, was the result of thirty years attention to our local botany. The knowledge of his habits and his methods of study during those years would have been of importance and value, and the incidents of his journeys must have been numerous and interesting. But we know of no record of them, and now the means of ascertaining them are gone. Our personal remarks are necessarily limited, but they are made with the feeling that Mr. Winch was worthy of a better record in the Transactions of this Society.

We are told that he was a man of small stature; and he was evidently of a sanguine temperament, indefatigable in his industry, and of indomitable will. He died in Newcastle, and the memory of his death is only marred by the severity of his bodily sufferings.

Mr. Winch commended a special study even in botany, but he was no specialist himself. He devoted himself to the subject broadly, and perhaps mostly to the Phænogams. It was therefore impossible for him to enter largely into the obscurities of the lower forms of the Cryptogamia, especially with the want of microscopic power and manipulation, now found to be necessary, to thoroughly and correctly investigate and determine these plants. In his *Flora* above quoted, he records some three hundred species and forms of lichens. Our list falls short of that number; but part of his lichens are in the collections of the Linnæan Society or in the British Museum.

Many of Winch's lichens were the gatherings of the Rev. John Harriman, who was an industrious and careful lichenologist. His exertions contributed largely to the knowledge of our northern lichenology, and to its extension, by the discovery of some new species. It would be interesting to know if Mr. Harriman left behind him any lichen-herbarium, and if so, what has become of it? Mr. J. Thornhill's handwriting marks many of those lichens in Winch's collection. Whether or not he did anything in gathering them we cannot say, but evidently he did something towards determining them. Some few of them are from Swartz, Sweden; and some of them are from other parts of England than Northumberland and Durham. The value of many of these plants is much diminished by having no locality or date attached. From the confusion in which they have been lying for so many years, some have suffered from dust and the ravages of insects. By the latter a few have been entirely consumed, nothing being left but the wood or bark on which they had grown.

In naming the following list according to modern lichen-nomenclature, we shall give first the name found attached to the plant, if any, and then the modern name. But, as in all old Herbaria, many are not the species they were taken to be; while sometimes different species are classed under the same name. And as this is not a systematic record of all the known lichens of Northumberland and Durham, but only that of a limited list, we have not introduced all the technicalities of

classification, but have simply recorded the list in the proper order of arrangement, giving the generic with the specific name; and in this order the plants are now arranged in the Newcastle Museum.

GONIONEMA, Nylander.

1. Cornicularia pubescens = *Gonionema Velutinum* (Ach.), Nyl. A specimen from Wermland, by Swartz.

COLLEMA (Ach.), Nylander.

2–3. Collema nigrescens = *Collema nigrescens* (Huds.) Two specimens; one by Winch, without locality, and one by J. Thornhill, from Co. Durham.

COLLEMODIUM, Nylander.

4. Collema fasciculata = *Collemodium microphyllum* (Ach.), Nyl. From Copygrove, Yorkshire.

LEPTOGIUM (Ach.), Nylander.

5. Collema tenuissimum = *Loptogium tenuissimum* (Dicks.), Mudd. A fragmentary specimen, from Bungay, Suffolk.

6. Parmelia saturnina = *Leptogium saturninum* (Dicks.), Nyl. "On trees and stones near Eglestone. Scarce. H."

CALICIUM (Pers.), Nylander.

7. Calicium stigonellum = *Sphinctrina turbinata* (Pers.), Fr. Gainford, Durham.

8. Calicium claviculare = *Calicium hyperellum*, Ach. No locality.

9. Calicium sphærocephalum = *Calicium populneum*, De Brond. Eglestone, in Teesdale, Co. Durham.

BÆOMYCES (Pers.), Nylander.

10. Bæomyces rufus (Huds.), D. C. Scotswood Dene, Northumberland.

11. Bæomyces roseus, Pers. No locality.

12—14. Lecidea icmadophila = *Bæomyces Icmadophila* (Trevis). Three specimens, but with no locality other than "on moors."

PILOPHORON, Tuck.

15. STEREOCAULON CEREOLUS = *Pilophoron cereolus* (Ach.), Nyl. Teesdale. Rev. J. Harriman.

STEREOCAULON, Scherb.

16. STEREOCAULON PASCHALE (L.), Fr. Teesdale, Durham.

17. STEREOCAULON CONDYLOIDEUM = *Stereocaulon condensatum*, Hffm. Gathered from a mud wall, at Edmondbyers, Durham.

PYCNOTHELIA (Ach.), Duf.

18. CENOMYCE PAPILLARIA = *Pycnothelia papillaria* (Ehrh.), Duf. On the Roman Aqueduct near Woodlands. This specimen is in fruit. The apothecia are small, fuscous, in clusters of 1 to 5 on the apices of the podetia or papillæ, and when developed are slightly podicellate; paraphyses are dense, indistinct; spores minute.

PLATYSMA (Hoffm.), Nylander.

19. LICHEN ALEURITES = *Platysma deffusum* (Webr.), Nyl. From Sussex.

20. CETRARIA GLAUCA = *Platysma glaucum* (L.), *Var. coralloideum* (Wallr.), Leigbt. Rocks, near Heddon-on-the-Wall.

PARMELIA (Ach.), Nylander.

21. PARMELIA SCORTEA, Ach. From Teesdale.

22—24. PARMELIA CONSPERSA (Ehrh.), Ach. Three specimens, from Eglestone, Warden Mill, and Keswick.

25. ,, ,, *Var. latior* (Schær.) From Keswick.

26. PARMELIA CORRUGATA = *Parmelia acetabulum* (Neck.), Dub. Specimen from D. Turner.

27. LICHEN FAHLUNENSIS = *Parmelia stygia* (L.), Ach. Near Eglestone.

28. PARMELIA AMBIGUA (Wulf.), Nylander. No locality.

NEPHROMIUM, Nylander.

29. NEPHROMIUM RESPINATA = *Nephromium lusitanicum* (Schær.) From Waskerley Park.

SOLORINA (Ach.), Nylander.

30. LICHEN CROCEUS = *Solorina crocea* (L.), Ach. From Swartz.

31. PELLIDEA SACCATA = *Solorina saccata* (L.), Ach. A fine specimen. From Teesdale.

32. COLLEMA SPONGIOSUM = *Solorina spongiosa* (Sm.), Nyl. A specimen, from Eglestone Fell, dated 1804.

This species, when fresh and moist, somewhat resembles a *Collema* in its dark green gelatinose thallus. Even Acharius was led astray by its appearance. The spores determine it at once.

PHYSCIA (Fr.), Nylander.

33. PARMELIA PARIETINA = *Physcia parietina* (L.), D. N. No locality. "Common."

34. LECANORA CANDELARIA = *Physcia lychnea* (Ach.), Nyl. From Eglestone.

35–36. PARMELIA STELLARIS = *Physcia stellaris* (L.), Nyl. Two specimens, from Ravensworth Woods.

37. ,, ,, *Var. leptalea* (Ach.), Nyl. This is named PAR. PULVERULENTA, and no locality given.

38. ,, ,, *Var. cæsia* (Hoffm.) Two specimens, from Gainford and Teesdale.

39. PARMELIA AIPOLIA = *Physcia aipolia* (Ach.), Nyl. No locality.

40–41. PARMELIA RECURVA = *Physcia obscura* (Ehrh.) Two specimens, from Healeyfield and Beamish Moor.

42. PARMELIA RECURVA = *Physcia adglutinata* (Flk.), Nyl. Sharnberry, near Eglestone. In Mr. Harriman's handwriting.

UMBILICARIA (Hoffm.), Nylander.

43. GYROPHORA PUSTULATA (Ach.) = *Umbilicaria pustulata* (L.), Hoffm. A moderate specimen, from Shaftoe Crags, Northumberland.

GYROPHORA (Ach.), Nylander.

44. GYROPHORA CYLINDRICA (Ach.) No locality.

45. GYROPHORA EROSA = *Gyrophora torrefacta* (Lighft.), Cromb. No locality.

46. GYROPHORA PELLITA = *Gyrophora polyrrhiza* (L.), Kbr. No locality.

PANNARIA, Del.

47. LECIDEA DECOLORANS = *Pannaria nebulosa* (Hoffm.) On the Earth, Teesdale.

48. PARMELIA PLUMBEA = *Pannaria plumbea* (Lighft.) Old trees, near Allansford.

49–50. COLLEMA NIGRUM = *Pannaria psotina* (Ach.) Two specimens; one from Boldon Hills, the other from Teesdale.

SQUAMARIA, D. C.

51. LECANORA CRASSA = *Squamaria crassa* (Huds.) A well developed specimen, from Middleton-in-Teesdale.

52. LECANORA SAXICOLA = *Squamaria saxicola* (*Poll.*) No locality.

53. PARMELIA SAXICOLA = *Squamaria saxicola* (*Poll.*) Found on walls and rocks in the following places:—Urpeth, Causey Hall, Eglestone, Gainford, Durham, and Warden Mill, North Tyne.

54. LECANORA GELIDA = *Squamaria gelida*, L. A fine specimen, in fruit, from Cronkley.

PLACODIUM, (D. C.), Nylander.

55–56. LECANORA MURORUM = *Placodium murorum* (Hoffm.) Cleadon Hills; also a specimen from the Coast.

57. PLACODIUM MURORUM, forma *lobulatum* (Smrft.) No locality.

58. LECANORA EPIGEA = *Placodium candicans* (Dicks.) Boldon Hills.

LECANORA (Ach.), Nylander.

59. LECIDEA PRUINOSA = *Lecanora glaucocarpa*, forma *pruinosa*, (Sm.) Walls, near Gainford.

60. LECIDEA IMMERSA = *Lecanora glaucocarpa*, forma *depauperata* (Kphlb.) Box Hill, Surrey.

61. ENDOCARPON SMARAGDULUM = *Lecanora squamulosa*, forma *smaragdula* (Whlnb.) On walls, Eglestone, Woodlands, and Butsfield.

62. LECANORA MILVINA = *Lecanora squamulosa*, forma *privigna* (Ach.) Eglestone.

63. LECIDEA PRIVIGNA = *Lecanora squamulosa*, forma *simplex* (Dav.) Gateshead Fell and Eglestone.

64–65. URCEOLARIA CINEREA = *Lecanora cinerea* (L.) Specimen has no locality. Also another specimen from Swartz, Sweden, which is forma *Verrucoso-areolata* (Leight.)

66–67. LECANORA TARTAREA (L.) Two fine specimens, well fruited, but with no locality recorded.

68. ,, ,, forma *grandinosa* (Ach.) Teesdale.

69. ,, ,, forma *frigida* (Ach.) No locality.

70. PARMELIA VARIA = *Lecanora varia* (Ehrh.) Near Gainford.

71. LECANORA ATRA (Huds.) Hill of Kinnoul.

72. PARMELIA ATRA = *Lecanora atra*, forma *grumosa* (Pers.) No locality.

73. PARMELIA CIRCINATA = *Lecanora circinata* (Pers.) Near the new bridge below Barnard Castle.

74–75. LECIDEA ERHARTIANA = *Lecanora polytropa* (Ehrh.) Two specimens; one from Gateshead Fell, the other with no locality marked.

76. ,, ,, *Lecanora polytropa*, forma *conglobata* (Smrf.) Eglestone.

77. L. CALVA = *Lecanora polytropa*, forma *illusoria* (Ach.) The Highlands.

78. PARMELIA SULPHUREA = *Lecanora sulphurea* (Hoffm.) Eglestone.

An observation on this species represents it as "only a diseased state of *P. glaucoma*." But the idea of disease is a mistake. It has a slight resemblance to some forms of *Lecanora glaucoma*, in the angular or flexuose appearance of the apothecia, but in the colour and reaction of the thallus it is sufficiently distinct from it, as a species.

79. LECIDEA SULPHUREA = *Lecanora sulphurea* (Hoffm.) Teesdale.

80. LECANORA ATRA = *Lecanora subfusca* (L.) No locality.

81. LECANORA SUBFUSCA, forma *argentata* (Ach.) From Teesdale and Heaton Dene.

82. LECANORA CERVINA = *Lecanora subfusca*, forma *coilocarpa* (Ach.) Muggleswick.

83—85. LECIDEA GALACTINA = *Lecanora galactina* (Ach.), forma *dispersa* (Pers.) Teesdale. There are two other specimens with no locality marked.

86. URCEOLARIA CALCAREA = *Lecanora calcarea* (Linn.) From Swartz, Sweden.

87—89. ,, ,, *Lecanora calcarea*, forma *concreta* (Schær.) Three specimens; one from Boldon Hills, and two without locality.

90. L. CRENULATUS = *Lecanora calcarea*, forma *contorta* (Hoffm.) No locality.

91–92. URCEOLARIA GIBBOSA = *Lecanora calcarea*, forma *Hoffmanii* (Ach.) Box Hill, Surrey. Two specimens.

93. LECIDEA FUSCO-ATRA = *Lecanora gibbosa*, forma *porinoidea* (Flot.) Gateshead Fell and near Eglestone.

94. LECIDEA ATHROCARPA = *Lecanora cæsio-cinerea*, forma *obscurata*, (Fr.)

95–97. URCEOLARIA ACHARII = *Lecanora lacustris* (With.) Three specimens; two from near Eglestone, and one without locality.

98—101. LECIDEA OEDERI = *Lecanora Dicksonii* (Ach.) Four specimens. Found in Teesdale and other places.

102. GYALECTA EPULOTICA = *Lecanora epulotica* (Ach.) Near Middleton, Durham.

103—105. LECANORA CERVINA = *Lecanora badia* (Ach.) Three specimens, from Eglestone, Muggleswick, and Teesdale.

106. PARMELIA FUSCATA = *Lecanora astriseda* (Fr.), Nyl. No locality.

107. PARMELIA PARELLA = *Lecanora parella*, (L.) No locality.

108–109. LECANORA TARTAREA = *Lecanora parella*, forma *pallescens* (L.) Two specimens, from Teesdale.

110—112. LECANORA PARELLA, forma *Turneri* (Sm.) Three specimens. Two without locality, and one from Eglestone.

113. LECIDEA RUPESTRIS = *Lecanora rupestris*, forma *incrustans* (D. C.) Gainford.

114. ,, ,, *Lecanora rupestris*, forma *viridiflavescens* (Wulf.) Teesdale.

115. LICHEN CALVUS = *Lecanora rupestris*, forma *calva* (Dicks.) Cleadon and Fulwell Hills, etc.

116. PARMELIA GLAUCOMA = *Lecanora glaucoma* (Hoffm. Without locality.

117. ,, ,, *Lecanora glaucoma*, forma *cinereopruinosa* (Leight.) No locality.

118—120. ,, ,, *Lecanora glaucoma*, forma *Swartzii* (Ach.) Three specimens; one from Sweden, and two without locality.

121–122. LECIDEA SUBCARNEA = *Lecanora sub-carnea* (Ach.) Two specimens; one from Swartz, Sweden, the other from Healeyfield, on the Derwent.

123. L. FLAVO-RUBESCENS = *Lecanora aurantiaca* (*Lighft.*) No locality.

124—126. ,, ,, *Lecanora aurantiaca*, var. *salicina* (Schrad.) Three specimens. One collected by J. H., which will mean Mr. Harriman, and dated 1804.

The locality is not given, but he says, "Common on trees." It is not common now; eighty-three years have seen some wonderful changes in the county of Durham. One, a fine specimen, is from Swartz, the other seems to have been gathered about Castle Eden Dene.

127–128. LECANORA SALICINA = *Lecanora aurantiaca*, forma *microthelia* (Ach.), Johns. Two beautiful specimens; both from the county of Durham.

I also found this form recently in the Wansbeck Valley. This is the first record of it for Great Britain. The thallus is granuloso-conglomerate, distinctly papulate or globoso-verrucose, and areolato-diffract. The apothecia spring out of the verrucæ, often crowded, margin thick, paler, flexuose.

129–130. LECIDEA CÆSIO-RUFA = *Lecanora ferruginea*, forma *genuina* (Körb.) Two specimens. One from Maryport, Cumberland; the other, a corticulous form, from Lanchester.

131–132. ,, ,, *Lecanora ferruginea*, forma *festiva* (Ach.) Two specimens; both from Lanchester.

133–134. *Lecanora cerina* (Ehrh.) Two specimens. One from Eglestone, the other without locality.

135. PARMELIA CHLOROLEUCA = *Lecanora cerina*, forma *chloroleuca* (Sm.), Th. Fr. Fulwell Hills, etc.

136. L. LUTEO-ALBO = *Lecanora pyracea*, forma *ulmicola* (D. C.) A fine specimen, from Teesdale.

137. L. CÆSIA-RUFA = *Lecanora pyracea*, forma *pyrithroma* (Ach.) A meagre specimen, from near Wycliffe, by Mr. Harriman.

138. LECANORA RUBRICOSA = *Lecanora arenaria* (Pers.) No locality given.

139. L. FRUSTULOSUS = *Lecanora sophodes*, forma *exigua* (Ach.) On a piece of tile, from the roof of the Parsonage, Denton, near Gainford. Mr. Harriman.

140—144. LECANORA HÆMATOMMA (Ehrh.) Five specimens. One from High Force, Teesdale, and four have no locality. Two of the five bear Mr. J. Thornhill's handwriting.

145–146. LECANORA HÆMATOMMA = forma *coccinea* (Ach.) This specimen bears Mr. Thornhill's handwriting, and is from High Force, Teesdale. There is also another specimen, without locality, but apparently in Mr. Harriman's writing.

147–148. LECIDEA VENTOSA = *Lecanora ventosa* (L.) Two fine specimens, from Teesdale moors. Both in Mr. Thornhill's handwriting.

PERTUSARIA, D. C.

149. ISIDIUM WESTRINGII = *Pertusaria urceolaria* (Nyl.) On walls, Teesdale.

150. ISIDIUM CORALLINUM = *Pertusaria dealbata* (Ach.) No locality.

151. ISIDIUM PHYMATODES = *Pertusaria dealbata* (Ach.) On the bark of old trees, Newton Cap Wood, near Bishop Auckland. Collected by Mr. Harriman, and dated 1804.

152. VARIOLARIA FAGINEA = *Pertusaria faginea* (L.) No locality.

THELOTREMA, Ach.

152A. THELOTREMA LAPIDINUM (Ach.) On trees, Ravensworth woods.

152B. THELOTREMA LAPIDINUM = *Thelotrema lapidinum*, forma *rupestre* (T. and B.) On stones, Teesdale, etc.

URCEOLARIA (Ach.), Nylander.

153. URCEOLARIA SCRUPOSA (L.) From Eglestone.

154–155. ,, ,, forma *bryophila* (Ach.) Two specimens. One from Matlock, and dated 1802; the other from Teesdale.

LECIDEA (Ach.), Nylander.

156–157. LECIDEA ATRO-RUFA (Dicks.) Two specimens, from Teesdale.

Gelatina hymenia, bright blue with iodine, but apices of paraphyses remain untinged, and retain their fuscescent colour.

158—161. LECIDEA LURIDA (Swartz). Four specimens. Two from Teesdale, and two without locality.

162. LECIDEA FUSCO-ATRA = *Lecidea crustulata* (Ach.) Teesdale.

163–164. LECIDEA FUMOSA = *Lecidea crustulata* (Ach.) No locality. Also a third specimen, the same.

165. LECIDEA QUADRICOLOR = *Lecidea decolorans* (Flk.) Gateshead Fell.

166–167. LECIDEA DECOLORANS (Flk.) Two specimens, from Teesdale, in Mr. Thornhill's handwriting.

168. LECIDEA QUERNEA (Dicks.) On trees, near Newcastle, etc. No trees near Newcastle bear this now. The smoke has obliterated it long ago.

169–170. LECIDEA SANGUINARIA (L.) Two specimens, from Teesdale.

Mr. Harriman says, The name of this lichen is given it because of a 'disease' it has, in common with some other species; and the disease "is not confined to the apothecia only, the whole inside of the crust is frequently diseased, and becomes crimson."

One can hardly suppress a smile at this disease theory with regard to lichens. We have seen thousands, and never saw one diseased. The crimson colour referred to in this species is simply the rich quantity of dye matter it contains, and is really a sign of healthy growth.

171. LECIDEA SABULORUM = *Lecidea sanguineo-atra* (Ach.) Eglestone.

This specimen has amongst the paraphyses, distinctly, the cærulescent granules spoken of by Th. M. Fries. L. Scand., p. 436.

172. ——— TERRIGENA = *Lecidea fusca* (Schær.) No locality.

173. Lecidea uliginosa (Schrad.) From Teesdale.

174. Lecidea miscella = *Lecidea aglæa* (Smrf.) Teesdale.

175. Lecanora subcarnea = *Lecidea aglæa* (Smf.) No locality.

176. Lecanora coarctata = *Lecidea coarctata* (Smrf.) From Eglestone.

177. Lecidea anthrocarpa = *Lecidea panæola* (Ach.) Cronkley Fell, Teesdale.

178. Lecidea silacea (Ach.) No locality.

179–180. Lecidea confluens = *Lecidea lapicida* (Fr.) Another specimen, but neither have the locality any further than "Mountain situations frequent."

181. Lecidea lapicida = *Lecidea lithophila* (Ach.) A small specimen, from near Ripon. This species very much resembles *L. lapicida* (Fr.), but differs, in not having a dark line subtending the sides and base of apothecia, and in the colour of apothecia being brownish-red, instead of nigricant.

182. Lecidea fumosa = *Lecidea rivulosa* (Ach.) Muggleswick.

183–184. ,, ,, *Lecidea rivulosa*, forma *depressa* (Leight.) Two specimens. One from Horsley Hope Dene.

185. *Lecidea fusco-atra*, forma *gibba* (Wahl.) No name, locality, or date.

186. Lecidea fumosa = *Lecidea fusco-atra*, forma *fumosa* (*Ach.*) Horsley Hope Dene.

187. Lecidea lapicida = *Lecidea fusco-atra*, forma *grisella* (Flk.) Barnard Castle.

188. Lecidea lapicida = *Lecidea fusco-atra*, forma *meiosporiza* (Nyl.) Gateshead Fell.

189. Parmelia ambigua, Var. radiata = *Lecidea fusco-atra*, forma *deusta* (Steuh.) From Swartz, Sweden.

190. *Lecidea lactea* (Flk.) No name, locality, or date. A good specimen.

191–192. LECIDEA SILACEA = *Lecidea contigua*, forma *flavicunda* (Ach.) Two specimens. One from Teesdale, by Mr. Harriman, the other with no specific locality. This species, or form, is often confounded with *L. silacea*, but it differs from that lichen in having areolæ of thallus flat, apothecia black, hymenium pale, and apices of paraphyses fuscescent instead of violet-black.

193. LECIDEA FUSCO-ATRA = *Lecidea contigua*, forma *umbonata* (Leight.) From Ben Lomond.

194. L. FUMOSA = *Lecidea contigua*, forma *meiospora* (Nyl.) No locality.

195. LECIDEA CONFLUENS (Webr.) A corroded specimen, without name or locality.

196. LECIDEA SILACEA = *Lecidea confluens*, forma *oxydata* (Leight.) Teesdale, etc.

197. SPILOMA TUBERCULATUM = *Lecidea sorediza* (Nyl.) Near Gateshead.

198. LECIDEA IMMERSA = *Lecidea calcivora* (Ehrh.) No specific locality, but "common on limestone rocks."

199. LECIDEA AMYLACEA = *Lecidea calcivora* (Ehrh.) From Swartz, Sweden.

200. LECIDEA ATRO-ALBA (Ach.) No locality.

201—203. LECIDEA PARASEMA = *Lecidea grossa* (Pers.) Three specimens. No locality given, but said to be "common."

204–205. LECIDEA VESICULARIS = *Lecidea cæruleonigricans*, (Lightf.) Two fine specimens, from Teesdale moors and Fawdon Slate.

206–207. LECIDEA CARNEOLA = *Lecidea tricolor* (With.) Near Gainford. Another specimen from Mr. Harriman.

208. LECIDEA CORTICULA = *Lecidea albo-atra* (Hoffm.) Gainford.

209. L. CONSPURCATA = *Lecidea albo-atra*, forma *margaritacea* (Ach.) No locality.

210. Lecidea epipolia (Ach.) Wycliffe Church, Durham. This also is now classed as a form of *L. albo-atra.*

211–212. Lecidea speirea = *Lecidea calcarea* (Weis.) Two specimens, from Boldon Hills.

213. Thelotrema exanthematicum = *Lecidea exanthematica* (Sm.) From Helbeck, Westmorland.

214. Urceolaria exanthematica = *Lecidea exanthematica* (Sm.) Near Barnard Castle.

215. Lecidea carneo-lutea (Turn.) This specimen is much corroded. It has no locality marked upon it, but "new species" is written upon it, evidently in Mr. Harriman's handwriting.

216–217. Lichen incanus = *Lecidea pachycarpa* (Duf.) Two fine specimens, from the New Forest, and dated 1816. This is one of the finest crustaceous lichens, and it seems to be unknown in the North of England and Scotland.

218. Lecidea abietina = *Lecidea premnea* (Ach.) Specimen from Epping Forest, much wasted with insects.

219. Lecidea citrinella (Ach.) Eglestone. The bright green-yellow thallus of this species seems to fade with time.

220. Lecidea carneola (Ach.) From Shipley Wood, Durham.

221. Lecidea luteola = *Lecidea rubella* (Ehrh.) Brookham, Surrey. The specimen has suffered from insects.

222. Lecidea geographicus = *Lecidea geographica*, forma *contigua* (Schær.) Eglestone, etc.

223. Lecidea atro-virens = *Lecidea geographica*, forma *contigua* (Schær.) No locality.

224. Urceolaria geographica = *Lecidea geographica*, forma *atro-virens* (L.) No locality.

225. Lecidea verrucolosa = *Lecidea petræa*, forma *cinerea* (Fw.) Muggleswick Fell.

226. Lecidea fusco-atra = *Lecidea petræa*, forma *fuscescens* (Leight.) Ben Lomond.

227. LECIDEA SPEIREA = *Lecidea concentrica* (Dav.) Teesdale moors.

228. LECIDEA PETRÆA = *Lecidea concentrica* (Dav.) No locality.

229. LECIDEA PETRÆA = *Lecidea concentrica*, forma *impressula* (Leight.) Teesdale.

230—233. LECIDEA MARMOREA = *Lecidea capularis* (Ehrh.) Four specimens. Two from Teesdale, one from Horsley Hope Dene, and one from near Sudley, endorsed W. B., which probably are the initials of W. Borrer.

234–235. URCEOLARIA DIACAPSIS (Ach.) There are two fine specimens of this lichen, from near Barnard Castle. This is one of the new species found by the Rev. J. Harriman, and named by ACHARIUS as above. But a micro-diagnosis of these specimens, shows that the species is not an *Urceolaria*, according to present lichen arrangement. Our diagnosis of the the two specimens named is as follows:—Thallus contiguous or rimose, unequal, white, farinose; hypothallus white; apothecia numerous, sometimes crowded, emerging from the thallus, sessile, fuscous, pulverulent, proper margin prominent with a spurious thalline margin, flexose; hypothecium thickish, nigro-fuscous; spores eight, simple, small, oblongo-ellipsoid, colourless; paraphyses gelatinoso-concrete, apices fuscous; gelatina-hymenea blue with iodine. Thallus K— C. Red.

On suggesting to the Rev. J. M. Crombie that this species should be named *Lecidea diacapsis*, he reminded me that Dr. Nylander, in his Lich. Scand. (which work I do not happen to possess), "refers the original specimen *Herb. Ach.*, from Harriman, to a form of *Lecanora calcarea*." But these two specimens in Winch's Collection, left behind by the same authority who gathered the first, while they thoroughly agree with ACHARIUS' description, as far as it goes, yet differ very considerably from *Lecanora calcarea*, as the reaction of the thallus alone shows. And assuming that these two specimens are

similar to the one examined by Dr. Nylander, then there needs a revision in the position of the species, for the two specimens here described are distinctly Lecideine.

LITHOGRAPHA, Nylander.

236. VERRUCARIA HARRIMANI = *Lithographa cerebrina* (Schær.) Teesdale.

OPEGRAPHA (Ach.), Nylander.

237. OPEGRAPHA PERSOONII = *Opegrapha saxicola*, var. *Chevallieri* (Leight.) Found on the "magnesian limestone," but no locality given.

238. OPEGRAPHA PERSOONII = *Opegrapha saxicola*, var. *Persoonii* (Ach.) No locality, but found on the "magnesian limestone."

239. OPEGRAPHA VULGATA = *Opegrapha varia*, forma *pulicaris* (Lightf.) No locality, but "common."

240. ,, ,, = *Opegrapha varia*, forma *tigrina* (Ach.) No locality.

241. LECIDEA LYNCEA = *Opegrapha lyncea* (Sm.) On oaks, Newton Cap Wood, near Bishop Auckland.

ARTHONIA (Ach.)

242. SPILOMA TUMIDULUM = *Arthonia cinnabarina* (Wallr.), forma *concolor* (T. and B.) No locality.

243. ARTHONIA PRUINOSA (Ach.) Newton Cap Wood, Durham.

NORMANDINA, Nylander.

244. *Normandina lætevirens* (T. and B.) From Horsley Hope.

VERRUCARIA (Pers.), Nylander.

245. PYRENULA NIGRESCENS = *Verrucaria mauroides* (Schær.) No locality.

246–247. PYRENULA UMBONATA = *Verrucaria thelostoma* (Harrim.) On whinstone, near Eglestone. Two specimens. Mr. Harriman discovered this lichen in the locality named, and probably these specimens belong to the original gatherings. Very rare.

248–249. ENDOCARPON TEPHROIDES = *Verrucaria fuscella* (Turn.) Two specimens, near Gainford, Durham.

250. *Verrucaria muralis* (Ach.) From Jesmond, Northumberland.

251. *Verrucaria conoidea* (Fr.) No name, but from Castle Eden Dene.

252. LECIDEA IMMERSA = *Verrucaria immersa* (Leight.) No locality, but "common."

253. LECIDEA IMMERSA = *Verrucaria incavata* (Nyl.) Teesdale. I failed to detect any spores in this specimen.

254. VERRUCARIA LITHINA = *Verrucaria umbrina* (*Whlnb.*) No locality. The spores of this species are large and distinct; some are fuscous, but not all, and with age the muralocular cellules burst out, and appear like so many small globular one-septate spores.

On the occurrence of Carabus glabratus, Fab., *in the County of Northumberland.*—In the midsummer of 1860 I collected a fine specimen of this species in the bed of the Blackburn, a small mountain stream that descends from the elevated moorlands to the south of the Stublick Dyke and the Hartley burn Coal-field. We had sought shelter in the burn for our mid-day meal, which was no sooner spread out than it was attacked by a *Carabus*, whose large size attracted attention, and led to its immediate capture. It proved to be a rare species, and the first taken in the south of the county of Northumberland.

In the Whitsuntide week of 1887, while walking over the moors at the head of the Wansbeck, near where that stream is only a foot or two wide, we saw a large *Carabus* walking slowly and with some difficulty over a large patch of moss. As it was an unusual place to meet with so large a beetle he was secured, and turned out to be another specimen of *Carabus glabratus*.

From these accidental captures it cannot be doubted, I think, that this species is more commonly distributed in our moorland districts than we have hitherto thought.—*Richard Howse.*

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ BY THE PRESIDENT, H. COOPER ABBS, ESQ., AT THE FORTIETH ANNIVERSARY MEETING, HELD IN THE LIBRARY OF THE LITERARY AND PHILOSOPHICAL SOCIETY, NEWCASTLE-UPON-TYNE, ON MONDAY, MAY 24TH, 1886.

Ladies and Gentlemen,—It is now my duty, as President during the past year, at this the fortieth anniversary meeting of the Tyneside Naturalists' Field Club, in compliance with a rule of our Club, to read an address containing a written summary of the proceedings at the several Field Meetings held during the year with such observations as I may deem conducive to the welfare of the Club and the promotion of its objects. In performing this duty, I desire first to express to you my sense of the honour which you did me in electing me to the office of President for the year which has now expired. I felt at the time of your electing me, and I feel still, that it is an honour of which I am unworthy. Though an ardent admirer and lover of Nature I have not made Natural History, or any particular branch of it, the subject of systematic study. I feel, therefore, that the honour you conferred upon me twelve months ago was more due to my having been for some years a member of the Club, and perhaps also in some degree to my relationship to a former President and original member of the Club (whom I now represent) than to any personal fitness for the post. I shall now endeavour to comply with the rule referred to.

The First Field Meeting of the year was held on Friday, May 29th, at Blaydon Burn, High Spen, and Rowland's Gill. About twenty members proceeded by train soon after mid-day from Newcastle to Blaydon Station. A brief conference was necessary here as to the appointment of the hour and place for a "frugal dinner," under one of the original rules of the Club, the landlord at High Spen, who had been requested to provide

for twelve members, having the previous night sent notice to the Secretaries that he declined to provide dinner beforehand for the Club, as the number of members who might probably attend could not be guaranteed by them. I do not mention this incident for the purpose of censuring the landlord, but for the purpose of drawing attention to the inconvenience that is caused by the neglect of members of the Club to inform the Secretaries, as requested in the notices of the meetings, of their intention to be present and to dine, or not, at the place appointed. After this conference, at which it was found impossible to appoint any place or hour for dinner, the members present left the town of Blaydon and entered the valley of the Blaydon Burn. Soon leaving the region of fire-brick and other kindred manufactories behind them the fresh foliage of spring (as yet unmarred by the smoke of the brick and other works in the neighbourhood) greeted them in the little valley. With the exception of two rather heavy showers the day was fine. Many of the spring wild flowers were found in bloom, though nothing new or rare was observed.

Leaving the valley at the hamlet of Blaydon Burn the party went through the fields by the footpath to the road leading through the village of Barlow, at which village some slight refreshment was obtained in view of the uncertainty of getting any dinner. Passing afterwards through High Spen the party arrived at a neat little wayside inn called "The Bute Arms." Here a halt was made soon after five o'clock. Some two or three of the party preferred pressing forward to Rowland's Gill, to catch the 6.20 train to Newcastle. The remainder, after a short wait, and having restored their energies with a substantial tea, visited the Chopwell Woods. By enquiry at the woodman's cottage permission to enter the woods was obtained. Rather a dearth of bird-life was noticed. One nest (Willow Wren's) only was seen. Emerging from the wood near Lintz Ford the party then struck the high road and enjoyed a very pleasant evening's walk to Rowland's Gill in ample time for the 9.28 train to Newcastle.

No formal business was transacted at this meeting.

The Second Field Meeting of the year took place on Wednesday, Thursday, and Friday, the 24th, 25th, and 26th of June, in Upper Wensleydale; but, owing to very wet weather for some time immediately before the 24th, and also upon that day, only a small number of members attended. Some of those who were present found their way to the King's Arms Hotel, Askrigg, previous to the morning of the 24th. This, the first day of the meeting, was very stormy and wet. A strong N.E. wind with continuous rain confined the party for the greater part of the day to the shelter of the "King's Arms." The old mansion Nappa Hall, about a mile and a half down the valley from Askrigg, was visited by some of the party during the morning. This interesting old hall, now used as a commodious farm-house, is in a state of fair preservation considering its age and altered circumstances. It dates from the fifteenth century, having been built in the reign of King Henry VI., and was then the seat of a family of the name of Metcalfe. In the following century Mary Queen of Scots, whilst in the custody of Lord Scrope, at Bolton Castle, in Wensleydale, in 1568–9, paid Sir Christopher Metcalfe a visit and remained two days a guest at Nappa Hall. The stormy weather somewhat moderating in the afternoon, the waterfalls of Mill Gill and Whitfield Gill, both within a mile of Askrigg, on Cogill Beck, were visited, and being swollen by the heavy rain were seen to advantage. Measurements of Whitfield Gill Fall were on the following Saturday morning made by two members of the Club before leaving Askrigg. The fall had by this time "run in." The height ascertained was 72 ft. 6 in.: the breadth, 42 ft. When seen on the 24th there would be a nearly uniform depth of between two and three feet of water, 42 ft. in width, falling unbroken from the ledge of rock which forms the bed of the stream and over which the water falls. On the Saturday morning (the 27th) the volume of water was so small that the same two members of the Club, the President and Mr. F. Spence, who made the measurements, bathing in the pool at the bottom of the fall, were able to go under the then heaviest part of it. They reported that the sensation produced by the smaller spray falling upon them from this height,

from the severity of its impact upon their bodies, was as of some dry and solid materials impinging against them, such as might be imagined of a shower of gravel or pebbles. The heavier volume of the water beneath which, though also broken up in its descent, it was found impossible to stand without resting the hands upon the shelving rock, and which bent the back and legs with its weight as it fell upon them, they likened to a shower of cobble-stones, with now and then a boulder. Amongst other plants were noticed this day the melancholy Thistle, Wood Sanicle, Sweet Woodruff, White Bedstraw, and Marsh Marigold. After dinner on this day two members were elected to the Club.

On the second day of this meeting (Thursday, June 25th) the members present divided into two parties. One party taking an early train from Askrigg to Hawes walked thence by Hardrow Scar up Fossdale Beck towards Muker in Swaledale to visit the "Buttertubs." The other party walked from Askrigg up the vale of the Ure to Hardrow and Hawes. The morning was cloudy with occasional showers, but the storm of the previous day had abated and towards noon the weather brightened and the rest of the day was very fine. The waterfall at Hardrow Scar is said to be ninety-six feet in height, but whether this is its present height, or its height before certain *repairs* which have been recently made to the rock over which it falls, I do not know. It is possible that since these repairs some ten feet or so must be added to the ninety-six feet. It now takes an unbroken leap from the built-up rock, level with the bed of its stream, into the dark pool beneath. This pool is nearly surrounded by lofty cliffs, in the form of a horse shoe, which echo and re-echo continually the roar of this imposing fall. The shaley cliff behind it, being softer than the superincumbent stratum of rock over which the water is precipitated, has receded by disintegration, forming a canopy under which is a footpath enabling visitors to walk behind and under the fall from one side of the stream to the other. During recent severe winters this fall has, I am told, been frozen into an immense icicle, through the centre of which the water descended, producing a

very curious and beautiful effect. Rather more than half-way from Hawes to Muker by the road up Fossdale Beck, and about three-quarters of a mile on the Muker side of the division of the watershed of Swaledale from that of Wensleydale, are the "Buttertubs," nearly 1600 feet above sea level. I am indebted to Mr. Faraday Spence, who was of the party, for the following description of and remarks upon these remarkable chasms, as also for the list of the plants observed by him growing within them.

"The 'Buttertubs' are on each side of and close to the road from Hawes to Muker, and are perpendicular holes in the limestone; the larger from ten to sixty feet in diameter, and from twenty to fifty feet deep. Some of the smaller are one to two feet diameter, and apparently fifty or sixty feet deep at least. Small trees and brushwood are found in the larger, and ferns are luxuriant in all.

"The theory that these are 'pot-holes' seems disproved by the fact that there is none of the roundness, smoothness, or horizontal marking, characteristic of pot-holes, produced by the grinding action of water carrying stones or sand, and swirling round and round. On the contrary there are innumerable vertical grooves, from one to two inches wide, separated by sharp edges; and from the sides project portions of rock, thin and knife-like at the top, gradually thickening to near the bottom, and then quickly tapering to a blunt point. These, in some places, resemble an armoury full of ancient weapons, halberds, swords, spearheads, and axes, all point upwards, growing out of the rocky walls.

"This formation and the vertical grooving are evidently caused by rain-water trickling down, and dissolving the limestone as it passes over the surface.

"The top of the limestone is covered by a bed about one foot thick of porous rock, quite crumbling where exposed. It is identical in appearance with the overlying peat, where that has been similarly exposed to the weather. It suggests that an ancient bed of peat has been petrified, and is now being disintegrated by solution of the limestone deposited in it."

Plants observed in the "Buttertubs":—

Pyrus aucuparia .....Mountain Ash.
Prunus padus .....Bird Cherry.
Fragaria vesca.....Strawberry.
Juniperis communis .....Juniper.
Spiræa ulmaria .....Meadow Sweet.
Thymus serpyllum .....Wild Thyme.
Cardamine pratensis .....Cuckoo-flower.
Potentilla tormentilla .....Tormentil.
Polygala vulgaris .....Milkwort.
Anemone nemorosa.....Wood Anemone.
Viola tricolor ... .Wild Pansy.
Saxifraga hypnoides .....Mossy Saxifrage.
Polypodium vulgare .....Common Polypody.
Aspidiidium aculeatum.....Prickly Shieldfern.
,, angulare .....Common ,,
,, filix-mas .....Male Fern.
Lastrea dilatata .....Broad Fern.
Athyrium filix-fœmina ....Lady Fern.
Asplenium trichomanes .....Common Spleenwort.
,, viride.....Green ,,
Cystopteris fragilis .....Bladder Fern.

Retracing their steps from the "Buttertubs" as far as the little village of Simonstone, the party who had visited them walked thence by the village of Sedbusk back to Askrigg. The evening was spent pleasantly by the two parties in telling over all that had interested them in their respective rambles.

I had been of the party which took train to Hawes and visited the "Buttertubs." Mr. Howse was of the party that walked from Askrigg to Hardrow and Hawes, and has kindly furnished me with the following account of the doings and observations of the latter party.

"Under the guidance of Mr. W. Horne, of Leybourne, who had kindly offered to be our Wensleydale Guide for one day, we made an early start for Hardrow and Hawes. Passing through the churchyard at Askrigg our attention was directed to a rather novel piece of praise on one of the tombstones. At the end of many other complimentary expressions the epitaph ended with these remarkable words—

"He was an honest attorney."

The only direct conclusion we drew was that the writer's experience was probably limited to Wensleydale, and that it was not the broadest view that could be taken on the subject. So we passed on without further comment or enquiry, and followed the main road leading due west, not far from the north bank of the Ure, to Hardrow, Mr. Horne pointing out any object of interest on our road. We carefully examined all the very old walls on the road side, but observed only specimens of *Cystopteris fragilis* (Bladder Fern), Wall Rue, *Saxifraga tridactylis*, Sweet Cicely, and the *Cardamine amara* (Bitter Cress). Most of these were common, but we failed to find the fern we most sought for and which was thirty years ago common in upper Wensleydale, the Scaly Spleenwort, though during our stay a specimen, in a very inaccessible situation fortunately, was pointed out to us. As many fine specimens of this fern and the Green Spleenwort, of great size, were formerly sent me from this district, where both were reported to be in considerable abundance, it is but fair to conclude that severe winters and the destruction of old walls and other conventional changes have assisted, with a little help from fern-maniacs, to almost extirpate these plants in Wensleydale.

"The only historical site pointed out to us, about a mile from Askrigg, was the spot where the monks of Jervaulx Abbey were first stationed in Wensleydale, in the Abbey of Fors, near the foot of Sargill Beck, at a place called the Grange. An old flat-headed doorway and portion of a trefoil window built into a wall, forming one side of an old barn, are the only remnants of the old Abbey left. Near this spot is a waterfall or force, of considerable beauty in wet weather, which seems to suggest the origin of the name Fors.

"Perhaps what would attract and strike the attention of a geologist most in the upper part of Wensleydale are the peculiar physical features, due to the occurrence of long, nearly parallel, and horizontal scars of mountain limestone, which occur at different levels on both sides of the valley for miles, and are only broken where tributary lateral streams have cut or worn out a more or less deep and wide channel on the lateral range of hills.

These tributary streams or becks are sometimes several miles long, originating among the hills, forming deep valleys, and generally disgorging on the Yore valley by sudden waterfalls or 'forces' of great height and beauty. The breadth of the main valley is also extensive, and very flat, excepting here and there where large mounds of moraine matter have been left in mid valley, the Yore passing on one side or other of the alluvial or glacial heaps which, being generally covered with trees, give variety and break up the otherwise monotonous flat through which the Yore's sometimes sluggish stream meanders; for only in one or two places did we see rocks *in situ* or anything approaching to a rapid in the upper part of the main valley. As a rule the sides of the valley are covered with verdure, sloping pastures partitioned off with long grey stone walls, the monotony of which is only broken by the numerous barns built high up on the valley sides, and a few farmsteads here and there, and only a few plantations; the latter becoming fewer and fewer as the national greed for land and beef and mutton increases. Here it may be remarked that the dale has nearly lost its reputation for making good cheese. We heard that some was still made at some of the old farms which had not lost caste or character. But the strong desire to have two crops in one year had generally prevailed, and the consequent result is that some good butter is sent to a ready market, and some bad cheese follows after, a kind of Old Peg. We saw a consignment of this kind being sent out of the dale to Barnard Castle, where, I fear, some of it would be at first sight taken by some of our own unfortunate excursionists for "Cotherstone."

"Hardrow was, after a few hours pleasant botanizing on old stone walls, reached about mid-day. Preparations were going on on a large scale for a monstrous excursion party and an uproarious band contest; so, after congratulating ourselves that our visit was well timed, we entered the rocky gorge which had been deeply cut through beds of sandstone and shale backward in a winding course into the hill side. The fall cannot be seen till you turn a corner, and then the white flowing Mare's Tail-shaped fall of water comes at once into view. The small quantity

of water is much broken into spray in its fall, and when the sun shines on it, then

> "Iris there with humid bow
> Waters the odorous banks, that blow
> Flowers of more mingled hue
> Than her purpled scarf can shew,
> And drenches with Elysian dew
> Beds of hyacinths and roses."

"We had the small ambition to slip or slide along the sloping bank behind the fall, and as there was a strong breeze blowing we were well besprinkled for our pains. We actually saw some less dignified visitors shielding themselves with an umbrella. The place is laid out at the expense of Lord Wharncliffe for visitors, so after passing through the spray we found a winding series of steps to the top, leading by a flagged road to a rustic bridge thrown over the stream just above the fall, where you can see the little stream take its precipitous leap. This flagged road is continued for nearly a mile up one side of the burn, and then is crossed to a shaded walk on the other; a beautiful sylvan scene, where people from "shoddy-lands" ought to be enchanted with the singing of the mavis and other natural music, and not require the thunder of drums and discordant sounds of amateur brass bands to drown those beautiful harmonies of Nature which we sat and listened to for a long time. The place has evidently been laid out with considerable taste for visitors to enjoy, and we again congratulated ourselves that we had seen the spot before it had been trampled down by a holiday crowd. We afterwards crossed over the broad valley to Hawes, and were obligingly shewn a finely-preserved stone implement (Celt), which had been thrown out of a drain-cutting a short time previously by some men employed on the Wharncliffe estate. This was the second that had been found within a short time.

"Hawes is rather an uninviting-looking place, irregular, and not well kept; and the inns and other buildings had for a country town nothing enjoyable to look at about them. Perhaps they are not favoured with a Town Improvement Committee and Borough and Improvement Rates, even on a small scale.

The waterfalls near Hawes would be very pretty but for the unsympathizing and unharmonious surroundings of the place.

"We returned to Askrigg by train, and after dinner proposed a vote of thanks to Mr. Horne, who had so obligingly and so well led our little party during the day, and the only source of regret was that more of our members who enjoy these rambles in the dales were not present to enjoy with us the beauties of Upper Yoredale."

The weather on Friday, June 26th, the third day of the meeting, was exceedingly fine. The members present, forming this day one party, started in good time for a ramble over the hill of Addleborough (an imposing eminence, rising to 1564 feet above the sea, on the side of the Valley of Ure opposite to Askrigg) and thence on to the lake of Semmerwater. Crossing the Ure to the village of Worton, the highway along "Scar Top" was followed to the village of Thornton Rust. "Scar Top" is the summit of a precipitous crag of mountain limestone extending altogether some two miles in length and varying in height in this distance from about twenty to forty feet. The highway runs close along the top of the crag, being protected by a low wall. Beneath the crag, upon the side of the hill sloping from its base down to the meadows and pastures in the Valley of the Ure, are some plantations of lofty trees; and from the highway on the top an extensive view is obtained, both up and down the beautiful valley. Nappa Hall, visited on the 24th, is seen on the opposite side of the valley. By following this route a more gradual and easy ascent of Addleborough is obtained. Therefore, having reached Thornton Rust, the party, as it were, "doubled" back, striking across Thornton Rust Moor for Addleborough, which they had in fact gone past. On the moor above Thornton Rust a view is obtained of Bolton Castle (some time, as already mentioned, the prison of Mary Queen of Scots), three or four miles down the dale. In a little stream on Thornton Rust Moor a portion of a Crayfish was found. Crayfish, we were informed, exist in considerable numbers and of large size in the Ure and in many of its tributary streams. The Crayfish found in this little stream, which could be easily stepped across

and must frequently be dry, had possibly been carried there—perhaps by some bird.

Addleborough was reached about mid-day. The top of this hill is a bed of limestone of considerable thickness, which forms craggy escarpments of some forty or fifty feet in height for a great part of its circuit (extending from its north-east side round the north and west to the south-west side). The eastern side, up which the party ascended, is steep but not craggy. The least steep part of the hill is that toward the south and south-east. There is a hollow depression in the central part of the top of the hill, so that when sitting there the rest of the country was completely concealed from our view, the horizon all round being the verge of the hill itself within a few hundred feet of us. This gave the idea of perfect solitude, which was rather enhanced than otherwise by the mournful cry of a pair of Golden Plovers, which inhabited the top and doubtless had their young near to us. On this dish-shaped height are the traces of old dwellings and habitations, which are now almost level with the ground, and are covered by the turf. Owing to the abundance of limestone many of the hills and elevated slopes are covered with fine grass, and the top of Addleborough was no exception, the very summit forming good grazing ground for cattle. At the base of the hill, on its south and south-east sides, which, as I have said, are the least steep, are a number of stone enclosures, of irregular form, but rudely approaching the circular. They are marked on the Ordnance Map as "Ancient Enclosures," and doubtless they are very ancient—probably ancient British or *pre-Roman*. These were examined, and some newly-cut drains in their vicinity were looked into with the hope of finding some implement of stone or bronze which might have been thrown out, but nothing of the kind was found. The position of these ancient enclosures is remarkable. They were at the base of Addleborough, on its most accessible side. From their strength and size they had been doubtless built for defence. They were too large for dwellings and too small for fields, and their stones were of very large size. But if built for defence of themselves only, and without relation to anything outside of them, they

were badly placed, for many stronger positions in the immediate neighbourhood could easily have been found. Were they not built for the defence of Addleborough on its weakest side? There were habitations on the top, and a large store of cattle could be driven there in time of danger, where they and the non-combatant population (the women, children, and infirm) would be safe. On its craggy sides the hill is almost inaccessible, and would require very little defence from the top. On its weakest sides are these stone enclosures, which, if for defence of themselves only, were really overlooked and commanded by the hill.

Leaving Addleborough, a rocky-bedded stream running into Semmerwater, and in the course of which are two considerable falls called respectively High Force and Low Force, was followed.

Passing by the foot of Semmerwater, a lake of about a mile long by half a mile broad, and across the river Bain which runs out of the lake towards and into the Ure, the party reached the quaint old village of Counterside, where, at a very small inn, they partook of some slight refreshment. On a stone built into the front wall of this little roadside inn is cut the following inscription, in four lines of two words each, apparently intended to rhyme, "Nunc mea, mox hujus, sed postea, nescio cujus," and underneath them the initials B. and I. in one line, with H. beneath them, and, alongside, the date 1667. None of the houses in the village looked of much more recent date. The party now directed their steps back along a pleasant country road towards Yore-bridge, passing on their way the village or small town of Bainbridge. A Roman Camp, of considerable size, called Brough in the old maps of Yorkshire, and forming a Station on the Roman Road running from East Yorkshire into Lancashire, was visited. It is very distinctly defined and occupies a strong position, being placed on a steep glacial mound in a bend or angle of the river Bain.

A most enjoyable day had been spent and Askrigg was reached about eight o'clock. Mr. Cobb, a gentleman staying at the "King's Arms" for the sake of angling, very kindly presented

us with a dish of Grayling and Trout, which he had caught in the Ure.

During the day the following plants were noticed:—Rock Cistus, Meadow Saxifrage, Mossy Saxifrage (800 feet), Sweet Cicely, Astrantia (cottage garden), Globe Flower, "Bonny Bird's Een," *Primula farinosa.* The Burnt Orchis, *Orchis ustulata,* was found by one of the party near the Ure. The Scaly Ceterach, now exceedingly rare but formerly common in Wensleydale (I have Mr. Howse's authority for this), was seen in an inaccessible spot by the party.

The Third Field Meeting was held at Warkworth, on Friday, July 17. The weather was all that could be desired. About twenty members left Newcastle by train soon after ten o'clock and proceeded to Acklington Station, whence they walked by way of Morwick Hall, the interesting grounds and gardens of which they were permitted to visit by the courtesy of Mrs. Dand. A large *Robinia Pseudacacia,* some thirty-five feet or more in height, was observed to be covered with its flower blooming in great luxuriance. Pursuing the high road past Morwick Hall for about half a mile a few members of the party made a short way across the country to the river Coquet, the others following the rather circuitous highway reached the river at the ford about three-quarters of a mile lower down. Crossing from the right to the left bank of the stream by the foot bridge at this ford the course of the river was followed to the Hermitage of Warkworth. Some time was occupied in examining this interesting and picturesque spot and in waiting until the party reunited, after which, the river being re-crossed by the ferry, the party made their way by the riverside to the stately ruin of Warkworth Castle. After a little time spent within the precincts of the Castle they repaired to the "Sun" Hotel, where dinner had been prepared for them. After dinner a visit was again made to the Castle and the interior of the "Keep" was inspected. The party then returned to the hotel, where conveyances were provided to take them to Warkworth Railway Station.

On the banks of the Coquet the Enchanter's Nightshade was in flower in great abundance.

It was my misfortune, owing to a lapse of memory which I very much regret (the notice of the meeting having been issued with that of the previous meeting), not to be present at the FOURTH FIELD MEETING of the Club, which was held at Twizell House and Belford on Monday August 3rd (Bank Holiday). I have been kindly furnished by Mr. Howse with the following minutes of the meeting.

"About thirty members and friends started from the Central Station, Newcastle, by the 8.20 A.M. train on that day, and alighted at the Lucker Station, where they were met by George Bolam, Esq., who most obligingly acted as guide during the day. The weather was unsettled, and heavy showers fell at intervals. Passing along green lanes the party walked through the grounds of Adderton Hall, where two fine examples of the Walnut tree, covered with fruit, attracted attention, from the rarity of this tree in this northern latitude. Reaching the main North Road, a sharp short walk southward brought the party to the entrance gate to Twizell House. The forest of Silver Firs (almost primeval in appearance), of gigantic size and height, and other tall coniferous trees, gave delight to the dwellers on the lower parts of the Tyne, where smoke and chemical fumes have destroyed all luxuriant growth of tree and shrub and flower. A walk of half a mile through this magnificent wood (almost in a state of nature) led to an open park, on the north side of which stands Twizell House—the House of Selby, the learned author of a large work on British Ornithology, an early member of the Natural History Society of Northumberland, Durham, and Newcastle-on-Tyne, and contributor of a Catalogue of Birds to the first volume of the Society's Transactions in 1831, and one of the first members of the Berwickshire Naturalists' Field Club more than fifty years ago. The Selby Collection of Birds, the original MSS., and many drawings of Natural History objects are still preserved in the hall, which, through the kindness of the present resident, George McLeod, Esq., and Mr. Bolam, the

members present were permitted to examine during a heavy shower. The birds are suffering from the hand of time, moths, and want of regular supervision, and doubtless many local rarities are now destroyed which formerly enhanced the value of this collection. The party next visited the gardens, and were obliged for a time to shelter themselves under trees (umbrageous enough to keep off a heavy shower), umbrellas, and other appliances. The old-fashioned garden of beautiful perennials was examined with much pleasure, embowered as it is in a surrounding dense wood, admitting sunshine and light enough, yet affording shelter from biting easterly winds and westerly gales. A long walk through the woods and by the rocky bed of the Waren-burn brought the party at length to Warenford, where conveyances were ready to carry most of them, including all the ladies, to the "Blue Bell" Inn, Belford. Here Mrs. Dunn had provided a substantial dinner, which seemed to complete the happiness of the party and was a fitting termination of an excursion which was much enjoyed by all, notwithstanding the copious showers that fell at intervals during the day. After dinner votes of thanks were passed to Mr. McLeod and Mr. Bolam for the attention they had kindly shown to the Club."

The Fifth Field Meeting was held at Saltburn-by-the-Sea, on Thursday, the 17th of September. About a dozen members were present. They were joined by Dr. W. Y. Veitch, of Middlesbro', a member of the Yorkshire Geological and Polytechnic Society, who kindly afforded them much help by acting as guide during the day. It had been intended to walk along the top of the cliff from Saltburn to Skinningrove and return by the shore under Huntcliffe. It was found desirable, however, on account of the tide, to modify this arrangement and walk in the first instance along the shore to Skinningrove and return by train to Saltburn. The first object of interest noticed was a large boulder of Shap Granite which had been found in cutting the road down to the beach and is now lying by the side of that road near a gateway leading to the Terrace Walks, not far from the spot where it was found. Near the bottom of this road, and

about thirty feet above the present level of high tide, Dr. Veitch drew the attention of the party to traces of an ancient sea-beach in a bank or hill of sand, in which were noticed many of the common marine shells now living along the Yorkshire Coast. Proceeding southwards along the beach under Huntcliffe, numerous nests of the House Martin were noticed built up against the underside of projecting ledges at a height of about 100 feet from the base of the cliff. The birds also were noticed and had apparently not finished their nesting operations. The section shewn in the lofty cliffs was minutely and carefully explained to the party by Dr. Veitch. These cliffs exhibit a nearly full section of the Middle Lias. Numerous characteristic fossils were gathered by the more enthusiastic of the party with so much attention and interest that unmarked by them the time slipped rapidly away, and it was long before they reached Skinningrove. They arrived there almost too late to do justice to the kindness of Mr. John Rogerson and Partner, who met them on the beach, conducted them through the Iron Works, and afterwards provided them with refreshment which was most acceptable after the stroll along the coast during a warm autumn day.

The party afterwards dined at Saltburn and returned to Newcastle by train in the evening.

Dr. Veitch has kindly furnished me with the following note of three new species observed by him in the Yorkshire Lias:—

"Whilst studying the Yorkshire Lias, collecting and identifying its fauna, several forms have been put aside for further and more careful consideration. Three of them have turned out to be species not previously described:

"A small bivalve of doubtful genus, found attached to Waldheimia resupinata, occurs in the main seam of ironstone in the Ammonites spinatus zone at Eston. Three examples.

"Another bivalve, found in the Ammonites oxynotus zone, Robin Hood's Bay. Although several specimens have been secured in a fragmentary condition from the shale I have been able to obtain only one perfect one, its preservation being due to its pyritous condition.

"*Isis liasica*, fragments of a sclerobasic coral, are of interest, because I can find no record of any such coral having been found in the Lias. It is of the tribe Isinæ. I have noticed it in the Ammonites capricornis and A. Jamiesoni zones at Huntcliff and Rockcliff, and A. oxynotus zone, Robin Hood's Bay. It is common, and gives the appearance of a robust horny-based coral branching dichotomously, and is inclined to be arborescent, and must have been three or four feet in height. Sections of it under the one inch objective show a coarse cellular structure at the outer margin, this disappearing towards the centre where parallel striæ become apparent, resembling the striæ in horn."

These species are figured and described by Dr. Veitch in the "Transactions of the Yorkshire Geological and Polytechnic Society," Vol. IX.

The Sixth and last Field Meeting of the year was held at Seaton Delaval on Friday the 9th of October. About fifteen members went by train from New Bridge Street to Seghill and walked thence to the avenue leading to Seaton Delaval Hall. On either side of this avenue, a mile and a quarter in length, is a belt of trees which have now been long past their prime and from their exposed situation have never been of any very great height. At the top or western end of the avenue are two high pillars resembling gate pillars, one on each side of the avenue, but not apparently ever intended to carry gates, being too wide apart and the road being a public highway. They were no doubt erected for ornament, and are surmounted by elaborate pediments. Time has been more sparing to these works of art than has the ruthless wantonness of ignorant and uncivilized people (whether boys or men) who apparently make it an habitual pastime to throw stones into the deeply recessed tympanums of the pediments above them. An accumulation of stones taken off the highway was noticed lying in the tympanums. By this senseless and mischievous amusement great part of the finely-chiseled moulding of the cornices has been entirely effaced, and the whole much injured. After some moments spent in deploring the wanton destruction of these symmetrical

works of a master-hand the members present wended their way by the avenue to the north front of Seaton Delaval Hall, a splendid pile, the work, as you are all aware, of that celebrated architect Sir John Vanburgh, and now a magnificent ruin. The present building stands within a few yards of the place where Delaval Castle, the ancient baronial seat of the Delaval family, formerly stood. As the central or main portion of the mansion is approached from the north, two wings at right angles to the central building are passed, one on either hand. The western wing contains the kitchens and other domestic offices; the eastern wing, the stables, etc. The western wing was destroyed by fire on the afternoon of May 6th, 1752, but was rebuilt. This wing is now furnished. By the civility of the housekeeper, who resides in it, we were permitted to look through it, and to inspect the paintings and portraits preserved there. Most of these portraits represent members of the family of Sir John Hussey Delaval, afterwards Lord Delaval, who succeeded to the estates in 1771 and died in 1808, and were painted by a local artist and portrait painter, Mr. Wm. Bell, of Newcastle-upon-Tyne, the son of a bookbinder in the same town.

The central and more interesting part of the building was next visited and examined. This portion of the building was destroyed by fire on the 3rd of January, 1822, being at that time the seat of Sir John Astley. About 100 yards or so south-west from the Hall is the chapel, which next received the attention of the party, and is of interest on account of its Saxon antiquity. A much more modern edifice, about a quarter of a mile to the south-east of the Hall, is the Mausoleum built by Lord and Lady Delaval to the memory of their only son, who died in 1775 at the age of twenty. This Mausoleum was next duly visited and the catacombs beneath inspected. Founded upon rock these catacombs are most solidly and strongly built; and though, as expressed in a local topographical work published not long after their construction, "calculated to last as long as the work of man can do," they have never been used for the purpose for which they were designed.

Leaving Seaton Delaval, the party walked through the

plantations to Seaton Sluice, once a busy little port and the source of large revenues to the Delaval family. This little harbour was first designed and constructed by Sir Ralph Delaval in the reign of King Charles II. At that time the entrance was by the natural mouth of the stream, which ran towards the north and was protected from the north-east winds by a stone pier. The King appointed Sir Ralph collector of his own port. The passage cut through the rock eastwards from the point where the stream turns towards the north was made by Lord Delaval in the latter part of the last century. A rest was made at Seaton Sluice and some slight refreshment partaken of, after which the party walked by the coast to Cullercoats, which place they reached after the shades of evening had already closed upon them.

Two Evening Meetings of the Club, jointly with the Natural History Society, have been held during my term of office, at neither of which, however, was I able to be present, which I very much regret. The first of these evening meetings was held in the Committee Room of the Literary and Philosophical Society, on Thursday, the 26th of November last. Dr. Embleton presided. The night was very stormy, but, notwithstanding, about twenty members attended. Mr. Hancock read a notice of the habit of the Young Cuckoo in ejecting the eggs and young of its foster parent from the nest, observed by him at Oatlands, Surrey, in June, 1884; also, a note on the Indian form of the Spotted Eagle shot on the Northumberland Coast, near Cresswell, on October 31st, 1885.

A long and interesting discussion followed the reading of Mr. Hancock's paper on the Cuckoo. Dr. Embleton read a note on the Birds seen by him at Nest House, Felling Shore, in May and June, 1884; also a note of the occurrence of Shrimps in considerable numbers in the Tyne, both below and several miles above the High Level Bridge; and a note on the capture of the "Bergylt" or Norwegian Haddock off the Tyne in June, 1884. The Rev. W. Johnson read a list of Lichens gathered by him during a ramble between Mitford and Morpeth on an early day

in the spring of 1884. Mr. Howse read a note on the visit of a shoal of Tunny to the Northumberland Coast in June, 1884; and a note on the capture of a very large Tunny in the salmon nets off Frenchman's Bay, near the mouth of the Tyne, in September, 1885. This specimen of the Tunny was presented by Mr. Clift, of South Shields, to the Natural History Society, and is now placed in their Museum, Barras Bridge. The several notes read at this meeting are already in print, and will very shortly appear in the Natural History Transactions of Northumberland, Durham, and Newcastle-upon-Tyne. Two members were elected at this meeting.

The second joint evening meeting was held also in the Committee Room of the Literary and Philosophical Society, on Thursday, the 8th of April last. Mr. Alex. Stevenson presided, and about forty members were present. Dr. Embleton read papers on "The Tyne, the Lort Burn, and the Skerne," and on "Place-names in Upper Teesdale." A list of Fishes that have been taken in the Tyne and within the Tyne Basin, compiled from several observers, was read by Mr. Howse.

The papers read at this meeting will also duly appear in the printed Transactions of the two Societies. One member was elected at this meeting.

I must now, in concluding my duties as President of our Club, which I am only too conscious of having very imperfectly fulfilled, again express to you my appreciation of the honour you did me in electing me to that position.

The following gentlemen were elected members of the Tyneside Naturalists' Field Club during the years 1885–6:—

At the Anniversary Meeting, May 19th, 1885:—Messrs. Arthur C. Margary, Lovaine Crescent; John Robison Bell, 4, Tankerville Terrace, Newcastle; Wm. E. Sisson, 11, Woodbine Terrace, Gateshead.

At Askrigg, June 24th:—Messrs. Wm. Fawcett, Quayside, Newcastle; John Bradburn Dodds, Whitley, by Newcastle.

At Evening Meeting, Nov. 26th:—Messrs. Bruce Kelly, 2, Collingwood Street; William Lee, 21, Mosley Street, Newcastle.

At Evening Meeting, April 8th, 1886:—Mr. R. C. Hedley, Cheviott, near Chollerford.

The Field Meetings for 1886 were arranged to be held as follows:—

May 31st	Ebchester and Neighbourhood.
June	Northumberland Lakes.
July 16th	Raby, Staindrop, and Winston Bridge.
August 2nd (Bank Holiday)	Boroughbridge, Yorkshire.
September 10th	Gilsland and Coombe Crag.
October 12th	Newbiggin-by-the-Sea.

THE TREASURER IN ACCOUNT WITH THE TYNESIDE NATURALISTS' FIELD CLUB.

FROM JANUARY 1ST TO DECEMBER 31ST, 1885.

Dr.

1885.		£	s.	d.
Jan.	To Balance brought forward	94	18	11
	,, Subscriptions	94	0	0
	,, Sale of Transactions	3	15	0
		£192	13	11

Cr.

1885.		£	s.	d.
Dec. 31.	By Commission for collecting Subscriptions.....	6	2	7
	,, Postage	0	19	10
	,, Secretaries' Expenses	9	8	0
	,, Journal, Circulars, &c.....	23	5	0
	,, Engraving	3	0	0
	,, Expenses, Anniversary	0	5	0
	,, Advertising	0	4	0
	,, Balance	149	9	6
		£192	13	11

1886, May 18th.—Examined and found correct,

T. P. BARKAS, AUDITOR.

The following gentlemen were elected officers of the Club for the years 1886–87:—

President.

Rev. J. M. Hick.

Vice-Presidents.

James Clephan, Esq.
John Hancock, Esq.
John Philipson, Esq.
D. O. Drewett, Esq.

D. Embleton, Esq., M.D.
Rev. Canon Tristram, F.R.S.
Rev. A. M. Norman, M.A.
Rev. J. C. Bruce, LL.D.
Rev. A. Bethune, M.A.
E. J. J. Browell, Esq, J.P.
Rev. R. F. Wheeler, M.A.
Prof. G. S. Brady, M.D.
H. B. Brady, Esq., F.R.S.
Rev. J. E. Leefe, M.A.
Rev. G. R. Hall, M.A., F.S.A.
G. H. Philipson, Esq., M.D.
Rev. R. E. Hooppell, LL.D.
A. S. Stevenson, Esq., J.P.
H. C. Abbs, Esq., J.P.

Treasurer.

R. Y. Green.

Secretaries.

Richard Howse.
Thomas Thompson.

Committee.

T. W. Backhouse.
Benj. Barkus, M.D.
Joseph Blacklock.
T. T. Clarke.
Wm. Dinning.
Jno. Glover.
Rev. W. Johnson.
William Maling.
E. C. Robson.
John F. Spence.
John T. Thompson.
Col. J. R. Young.

Auditors.

J. S. Forster.
T. P. Barkas.

XIX.—*On a Spinal Column of Loxomma Allmanni,* Huxley.*

By D. Embleton, Esq., M.D., F.R.C.P.

The subject of this paper was briefly described by our late friend, Mr. Thomas Atthey, at page 46 of this volume of our Transactions. Since 1884, when the first part of the Transactions was published, the specimen has been more carefully cleared of the matrix by Mr. Dinning, and a new, more detailed, and exact description of it has been deemed necessary.

Mr. Alderman T. P. Barkas, F.G.S., who presented the subject of this paper, in the autumn of 1887, to the Museum of the Natural History Society of Northumberland and Durham, informs me that it was discovered about seventeen years before, by a miner named Swain, in the roof of the Low-Main Seam of Coal at Newsham Colliery, near Blyth, Northumberland. It was the duty of Swain and others, after the hewers had finished their day's work, to take down and remove, during the night, the shale which the hewers had left, and which usually overlies this seam of coal. Whilst thus employed Swain observed in the overhanging shale indications of a chain of bones, which he rightly took for the remains of some large animal.

The object noticed being of unusual magnitude, he was anxious and careful to obtain it in as perfect a state as possible. Laying down his rough coat on the floor of the mine under the position of the fossil, and gently detaching the shale in which it was imbedded, he placed it carefully, in eight pieces, which quite fitted each other, on his coat, and conveyed the whole "out-bye," and thence to Newcastle, to Mr. Barkas, who, finding it was a vertebral column, though much obscured by the matrix in which it was imbedded, contented himself at the time by working off only a portion of the matrix.

It was noticed and figured by Mr. Barkas in 1873, in his "Illustrated Guide to the Fish, Amphibian, Reptilian, and

* The generic name is from the Greek Λοξός, oblique, and ὄμμα, an eye = oblique or squint eye. The specific name is from that of the well-known Professor of Natural History, Dr. Allmann.

supposed Mammalian Remains of the Northumberland Carboniferous Strata," under the name of *Macrosaurus polyspondylus*. At that time it had been, as already said, very imperfectly cleared from its matrix, so that an accurate description and drawing was impossible.

No other part of the skeleton than the spine, and a few fragments of ribs adherent to it, was brought away. The only other organic relic found on the specimen was a fragment of a tooth of a *Megalichthys*, which remains in *situ* near to the second neural spine, at the anterior end of the specimen.

In 1877, Mr. Barkas placed the fragmentary specimen in the hands of the late Mr. Thomas Atthey, an ardent collector and skilful preparer and investigator of fossils, to be worked out, for presentation to the Newcastle Museum. He devoted his whole time and energies to the task; but, unhappily, in the midst of his unremitting application he was stricken with temporary blindness and persistent paralysis, and could not afterwards resume the work which he had set his mind to accomplish.

The specimen was afterwards placed in the hands of Mr. Dinning, who enclosed it in an artificial matrix and a frame, and so successfully cleared away the remaining parts of the matrix as to leave little further to be done.

The fossil is seen to consist of a much longer series of vertebræ of the spinal column of *Loxomma Allmanni* than has hitherto been recovered from the Northumberland Coal Field.

It consists of two fragments of very unequal length. The longer is an uninterrupted series of thirty-two bodies of vertebræ with their intervertebral disks, and a small portion of an anterior zygapophysis of another vertebra. In connection with these vertebræ are several parts, more or less imperfect, of ribs. The specimen lies on its right side, in a slightly curved line, and measures four feet one-and-a-half inch in length.

The shorter fragment is only six inches in length, and is separated from the former by a space which is artificial, and does not at all represent that which in the natural state would have been occupied by missing vertebræ, the number of which can only be matter for conjecture.

On looking along the spine there is an appearance of alternation of large and small vertebral bodies, which is owing to the alternate succession of centra and intervertebral disks; these latter, being less firm and solid during life, have shrunk more after death than the former.

In Mr. Barkas' "Guide" above mentioned, the disks had been counted as vertebral centres, and in the paper by the late Mr. Atthey and myself, "On the Skull and other Bones of *Loxomma Allmanni*, Huxley," in Vol. V. of the Natural History Transactions of Northumberland and Durham, p. 219, it is stated, that "the centra of the vertebræ are commonly of considerable size, alternately large and small." Both this statement and Mr. Barkas' counting are erroneous, the appearance of alternation being caused as above stated.

The skull, and an unknown number of vertebræ at each end of both fragments, also the sternum and by far the greater part of the ribs, with the thoracic and pelvic girdles, and their limbs (if such existed) are absent. It is therefore a difficult matter to estimate the length and bulk of such a creature, which must have been an adult.

In the first place, we know that the total length of the two fragments under consideration is four feet seven and a half inches. In the next place, allowance must be made for the length of the absent parts. From what we know of skulls of *Loxomma* in our Museums and elsewhere, we may safely take the length of the cranium to have been fourteen inches. For the length of absent vertebræ, which should connect the anterior end of our longer fragment with the occiput, we assume it to have been four or five inches. For absent vertebræ, to fill up the gap between our two fragments, we allow six or more inches. For vertebræ wanting at the posterior end of the lesser fragment, including the caudal extremity, not less than six or even seven feet—the tails of modern amphibians, crocodiles and alligators being fully as long as, or even longer than, the body and head together. Lastly, for shrinking during the decomposition and fossilization of the body, we allow two inches. Thus, 4 ft. 1½ in. + 6 in. + 1 ft. 2 in. + 5 in. + 6 in. + 6 ft. 10 in. + 2 in. =

13 ft. 8½ in. So that with these allowances, which appear reasonable, this specimen of *Loxomma* when living may have been about fourteen feet in length. Its bulk we can only conjecture; it may have been that of an adult crocodile or alligator.

All the vertebral bodies are longitudinally grooved, and have concave anterior and posterior surfaces.

As to the vertebræ marked Nos. 1, 2, and 3 on the specimen at the cephalic end, it is doubtful whether they are posterior cervical or anterior dorsal. Their bodies are somewhat smaller than those which follow, and rather distorted. Each has on its left side a small, ovoid, concave facet, for articulation with the head of a rib. It is therefore presumable that they are dorsal centres. If they are not dorsal, then the animal had been furnished with cervical ribs. Those marked Nos. 2 and 3 are much alike, but gradually and slightly decrease in size backwards. The 4th, 5th, and 6th resemble each other, and with the 7th are somewhat fragmentary.

Each of the vertebræ marked Nos. 4, 5, 6, 7, exhibits on its left side a distinct process standing out, having a terminal, concave, ovoid surface, for articulating with the head of a rib. Two short fragments of ribs lie over the vertebræ Nos. 4 and 5. Three of the above four vertebræ have each a broad, flat, smooth, square, well-defined, neural spinous process, beyond which, in the matrix, are the broken-off articular heads of two ribs; on one of which is imbedded the slender bright tooth of *Megalichthys* before mentioned. The zygapophyses of these vertebræ, which adjoin each other, have in three instances retained their normal juxtaposition. From these processes to the tops of the neural spines there is a length of one inch and five-eighths. The width of these spinous processes at top is a full inch. The best preserved centres of these four vertebræ measure from anterior to posterior border at the lowest part three-quarters of an inch.

No. 8 has suffered from pressure, and is indistinct. By its side lies a broken bit of a rib.

Nos. 9, 10, 11, and 12 are, together with their intervertebral disks, better preserved. Their neural spines are fairly visible, and about the same size as those of Nos. 4, 5, 6, and 7; but

their zygapophyses are less evident. No. 11 has a broad spinous process; that of No. 12 shorter, and as if bent over. On all these bodies there are costal articular facets.

Beyond the neural spines of Nos. 10 and 11 there are imbedded in the matrix, and belonging to the right side of the column, three portions of ribs; one of which is merely a small fragment; another is very strong, and has its head lying under the flat spinous process of No. 9; the third, about one inch and a half long, shows the oval superficial articular cavity of its head.

On the lower side of this part of the column are four fragments of ribs, lying nearly in the same direction as the column, and varying in length from four to six inches; their heads are not perceptible.

Nos. 13 and 14 have lost their spinous processes, and through No. 13 runs a fissure. No. 15 is imperfect.

Nos. 16, 17, 18, and 19 have their neural spines nearly entire, and these are one inch and a half wide at their top. Their bodies are stout, and their zygapophyses in normal juxtaposition; and on them are facets for ribs, very like those on Nos. 10, 11, 12, and 13. Lying under Nos. 14 and 15 are fragments of five ribs massed together, and all broken off at the edge of the specimen.

Nos. 20, 21, 22, 23, and 24 have lost all processes; but each has a well-marked facet for a rib. Below Nos. 21 and 22 are lying four fragments of ribs, more slender than those above mentioned. Under No. 24 is a small fragment of rib pointing backwards.

Nos. 25, 26, 27, 28, 29, and 30 are of diminished size. Below No. 25 is a flat piece of bone, in width about one inch and a half, not understood, but suspected of some relationship with a possible pelvic girdle, and on this piece lies the head of the first of the following series of costal bones, deserving of special notice. They belong to the right side of the spine, and are seven in number, with an indication of an eighth.

Each of these peculiar ribs appears double, as if formed of two ribs, united by a smooth, rather concave plate, each having a small articular surface for articulation; the outer-lying one

for the intervertebral disk and adjoining vertebral bodies; the inner-lying one for a transverse process, or it may be representative of the rib tubercle, which may have supplied the place of a transverse process.

The first of the series differs from those that follow it; but this may be apparent only, owing to its two parts being folded one over the other.

The second and third resemble each other. Their upper parts are perfect. Their connecting plate continues downward for one inch and a half, and ends in a curved, concave border. The lateral parts, in form of ribs, go on separately beyond, that lying next the column being very much shorter than the other.

The fourth, which is somewhat similar, is only one inch and a quarter long in the plate, and the short limb or rib is shorter than that of the third.

The fifth is fragmentary, about two inches long altogether, and its head lies in its proper relation to the vertebral column.

The sixth and seventh are smaller fragments still, and the eighth is insignificant. These are portions of rib heads, and lie on their proper intervertebral disks.

From No. 30 to the end of the long part of the specimen are two more vertebræ, about the same size as those last noticed. They are tolerably perfect, showing neural spines nearly entire, broad, and smooth, except for a ridge running down their middle, and curving backwards and downwards to the posterior zygapophysis. This ridge implies an increased muscular development at this part of the spine of the animal. The zygapophyses here all lie in their normal positions. Beyond these vertebræ there is in the matrix a small detached portion of another zygapophysis, which belonged to a 33rd vertebra.

Nos. 25, 26, 27, 28, 29, 30, 31, and 32 form that part of the specimen which has been figured in the accompanying Plate VI., fig. 1, at one-half the natural size.

The short portion of the specimen lying posterior to and apart from that just described consists of four vertebral bodies and intervertebral disks, broken off somewhat on the upper surface. On each is a more or less distinct articular facet, perhaps for

chevron bones peculiar as adjuncts to caudal vertebræ. How much of the vertebral column is wanting between the two portions it is, with our present knowledge of the osteology of *Loxomma*, impossible to say; but, seeing the large size of the vertebræ terminating the long portion, and the comparatively small size of those forming the short portion, it has evidently been considerable. It seems on the whole not improbable that the short portion of the specimen consists of caudal, perhaps anterior caudal, vertebræ.

The specimen herein described is assumed to be the remains of a *Loxomma Allmanni*, since its bones closely resemble those which have been, on the authority of Huxley, declared to have belonged to that Labyrinthodont Amphibian. The remains appear to have belonged to an adult animal.

It is much to be regretted that further search had not been made to find the rest of the skeleton at the time the spine was discovered. The head and the rest of the missing parts might possibly have been recovered, so as to have allowed of the restoration of the whole framework of the animal.

There is no evidence adducible to show that *Loxomma* had been furnished with any kind of defensive armour.

Doubtless this great Amphibian was an air-breathing, powerful, and predacious inhabitant of the muddy swamp or lake, possibly of warm water, that in remotely ancient time occupied the surface of the country where now is Newsham, and which succeeded to the long series of ages during which the dense tropical vegetation flourished that was afterwards converted into that particular seam of coal now known to us as the Low Main.

It swam like a fish, urged on by its powerful caudal propeller, and guided partially by its limbs; and was probably capable of crawling on to ground like the newts and reptiles of the present day.

The specimen herein described, as well as the skull, vertebræ, and other bones and teeth of *Loxomma Allmanni*, with drawings of these, are exhibited in the cases containing the Coal Measure Fossils in the Geological Department of the New Museum of Natural History, Newcastle-upon-Tyne.

The minute structure of the teeth of *Loxomma* is admirably shown in drawings from microscopic sections, by the most accurate pencil of Mr. Dinning, one of our Secretaries, in the Plate IV., Vol. V., of the "Nat. Hist. Trans. of Northumberland and Durham."

The accompanying Plate, representing about a fourth part, comprising eight vertebræ, of this specimen at the posterior end of the longer fragment, and showing the peculiar ribs above described, exhibits the part one-half of the natural size. It is also from a drawing by Mr. Dinning.

EXPLANATION OF PLATE VI.

Fig. 1. Vertebræ Nos. 25 to 30, one-half natural size.

Fig. 2. Reduced drawing of the whole specimen, one-eighth natural size.

RULES OF THE TYNESIDE NATURALISTS' FIELD CLUB.

REVISED 1864.

1.—That the Society shall be called the TYNESIDE NATURALISTS' FIELD CLUB, and have for its object the practical study of Natural History, in all its branches, and that the Antiquaries of the District be invited to unite with the Club for the promotion of their pursuits through its meetings.

2.—That the officers of the Club be a President, (who, on the close of his term of office, shall become a permanent Vice-President), four elected Vice-Presidents, (two of whom shall retire each year), a Treasurer, two or more Secretaries, and local Secretaries, in such places as it may be thought desirable, who, with twelve other members of the Club, shall form a Committee.

3.—That an Annual Meeting of the Club be held in Newcastle, not later than the month of March in each year, for the purpose of electing the officers for the ensuing year, auditing the accounts, selecting the places for the Field Meetings, and transacting any other business which may be brought before it. The President of the preceding year shall also be requested to favour the members with an address at this meeting, containing a written summary of the proceedings at the several Field Meetings, together with such other observations from himself, as he may deem conducive to the welfare of the Club and the promotion of its objects.

4.—That five or more Field Meetings be held during the year, in suitable localities, for investigating the Natural History and Antiquities of the district, selected and approved by the Annual Meeting, and that timely notice of each be given to the members by a circular from the Secretaries. That at each meeting the hour for a frugal dinner shall be appointed by the Chairman, after which any papers received from members of the Club, and approved by the Committee, shall be read from the chair.

5.—That Evening Meetings be held at Newcastle during the

winter months, at such time and place as the committee may appoint, for the purpose of reading and discussing such papers, as there may not be time or opportunity properly to consider at the Field Meetings.

6.—That all candidates for membership shall be proposed and seconded by existing members, in writing, at any meeting of the Club, and shall be elected by a majority of the votes of the members present.

7.—That an entrance fee of five shillings and a subscription of five shillings yearly shall be paid by each member, to defray the cost of printing and illustrating the Transactions of the Club, and to meet any unavoidable outlay for stationery, postage, etc.

8.—That the Secretaries be empowered to strike off the list any members whose subscriptions shall remain more than two years in arrears, after being applied to for payment by circular from the Secretaries or Collector.

9.—That a class of honorary members be admissable, consisting of ladies and gentlemen, distinguished for their attainments in the study of Natural History or Antiquities, and to whom the Club may be indebted for the communication of papers or specimens..

10.—That the Club shall undertake the formation of correct lists of the various natural productions of the Counties of Northumberland and Durham, with such observations as their respective authors may deem necessary; as well as succinct accounts of the Geology of the district; and that, for fully carrying out this plan, the assistance and co-operation of parties studying Natural History in the North of England, whether members of the Club or not, be requested.

11.—That for the purpose of thoroughly identifying the species referred to in the proposed lists, authentic local collections be formed and placed, with the consent of the Natural History Society, in the Newcastle Museum. The collections shall become the property of the Natural History Society, but the specimens

in them shall be distinguished by some mark to show that they refer to the lists.

12.—That these lists, the address of the President, and any other papers communicated to the Club which the committee may deem suitable for publication, shall be printed, in conjunction with similar papers of the Natural History Society, in a cheap octavo form, under the name of the "Natural History Transactions of Northumberland and Durham," and distributed gratuitously to all the members whose subscriptions are not in arrear.

13.—That the Club shall endeavour to discourage the practice of removing rare plants from the localities of which they are characteristic, and of risking the extermination of rare birds and other animals by wanton persecution; that the members be requested to use their influence with landowners and others, for the protection of the characteristic birds of the country, and to dispel the prejudices which are leading to their destruction; and that consequently the rarer botanical specimens collected at the Field Meetings be chiefly such as can be gathered without disturbing the roots of the plants; and that notes on the habits of birds be accumulated instead of specimens, by which our closet collections would be enriched only at the expense of nature's great museum out of doors. That in like manner the Club shall endeavour to cultivate a fuller knowledge of the local antiquities, historical, popular, and idiomatic, and to promote a taste for carefully preserving the monuments of the past from wanton injury.

TYNESIDE NATURALISTS' FIELD CLUB.

LIST OF MEMBERS, 1889.

Elected.		
1863	Abbs, Henry	Cleadon House, Sunderland.
O.M	Adamson, C. M.	Crag Hall, Jesmond, Newcastle,
O.M.	Adamson, William	Cullercoats.
1858	Adamson, Horatio	99, Howard Street, North Shields.
1877	Adams, W. E.	32, Holly Avenue, West Jesmond, N/C
1875	Addison, John George	17, North Bridge, Sunderland.
1888	Allison, Rev. J. W.	36, Grey Street, Blyth.
1882	Angus, W. M., Lieut.-Col.	Fenham Hall, Newcastle.
1882	Appleton, A. M.	12, Elvet Bridge, Durham.
1886	Archer, Mark	Nesham Lane, Bensham, Gateshead.
1849	Armstrong, George	Amen Corner, Newcastle.
1876	Armstrong, J. F., M.D.	23, Victoria Terrace, South Shields.
1876	Armstrong, T. J.	Hawthorn Terrace, Newcastle.
1877	Arnison, W. C., M.D.	Eldon Square, Newcastle.
1866	Backhouse, T. W.	West Hendon House, B'pwearmouth.
1859	Barkas, T. P., F.G.S.	Art Gallery, Newcastle.
1879	Barker, Thomas B.	Westoe, South Shields.
1876	Barkus, Benjamin, M.D.	Jesmond Terrace, Newcastle.
1859	Barnes, J. W.	Messrs. Backhouse & Co., Durham.
1861	Barron, Thomas W., M.B.	10, Old Elvet, Durham.
1877	Bartram, Robert A.	Hylton, Sunderland.
1874	Barwick, John S.	The Cedars, Sunderland.
1877	Beckingham, J. H.	Percy Park, Tynemouth.
1860	Bell, Sir I. L., Bart.	Rounton Grange, Northallerton.
1880	Bell, J. R.	4, Tankerville Terrace, Newcastle.
1860	Bell, John Thomas	Iron Works, Monkwearmouth.
1860	Beck, W. E.	Slate Yard, Gallowgate, Newcastle.
1876	Benson, J. G.	12, Grey Street, Newcastle.
1849	Bethune, Rev. Angus	The Vicarage, Seaham.
1851	Bewick, T. J.	Haydon Bridge.
1889	Bidwell, Edward	1, Trigg Lane, Upper Thames Street, London.

Elected.		
1867	Bird, Rev. C.	Chollerton, Hexham.
1879	Bird, Henry Soden	15, Grey Street, Newcastle.
O.M.	Blacklock, Joseph	11, Summerhill Terrace, Newcastle.
1872	Blair, Robert	Ocean Road, South Shields.
1873	Bolam, Charles	Stella, Blaydon-on-Tyne.
1886	Bone, W. J.	61, Linskill Terrace, North Shields
1858	Booth, George R.	50, West Sunniside, Sunderland.
1876	Bowden, Thomas	Sheriff Mount, Gateshead.
1853	Bradford, George	Etherley, Bishop Auckland.
1853	Bradford, James	Bunker's Hill, Fence Houses.
1849	Brady, Prof. G. S., M.D.	2, Mowbray Villas, Sunderland.
1858	Brady, Henry B., F.R.S.	5, Robert St., Adelphi, London, W.C.
1865	Branford, W. E.	90, Grey Street, Newcastle.
1878	Branford, Mrs.	90, Grey Street, Newcastle.
1860	Briggs, R. S.	21, Fawcett Street, Sunderland.
1850	Browell, E. J. J.	East Boldon, Newcastle.
1872	Brown, Rev. Dixon	Unthank Hall, Haltwhistle.
1871	Brown, Rev. J. J.	Silksworth, Sunderland.
1860	Brown, John	69, Blenheim Street, Newcastle.
1876	Brown, John	269, Westgate Road, Newcastle.
1879	Brown, John H.	19, Collingwood Street, Newcastle.
1877	Brown, M. Walton	3, Summerhill Terrace, Newcastle.
1886	Brown, W. Forster	Marsden Colliery, South Shields.
1854	Bruce, Gainsford, M.P.	2, Harcourt Buildgs, Temple, London.
O.M.	Bruce, Rev. J. C., LL.D., D.C.L.	Framlington Place, Newcastle.
1878	Buchanan, John	Earsdon.
1884	Burdon, John, J.P.	Durham.
1861	Burnett, Rev. W. R., M.A.	KelloeVicarage, Coxhoe, Co. Durham.
1874	Burns, David	Clydesdale Bank Buildings, Carlisle.
1872	Burnup, Edwin	60, Maple Street, Newcastle.
1860	Burnup, John, Jun.	2, Devonshire Terrace, Newcastle.
1879	Calvert, Rev. Thomas	15, Albany Villas, Hove, Brighton.
1879	Cairns, A. D.	Piers Works Office, Tynemouth.
1865	Carr, John	21, Norfolk Street, North Shields.
1374	Cay, Matthew	Westoe, South Shields.
1868	Charlton, Richard	20, Claremont Place, Newcastle.
1861	Charlton, W. H.	Causey House, Gosforth.
1880	Clark, George	22, Belgrave Terrace, Newcastle.
1871	Clark, Isaac	Blaydon-on-Tyne.
1870	Clarke, H.	24, Dockwray Square, North Shields.
1868	Clarke, T. T.	Post Office Buildings, North Shields.
1881	Clarke, Mrs.	Chirton Cottage, North Shields.

Elected.		
1865	Clay, William	Abbotsford Terrace, Newcastle.
1854	Clayton, John	Fenkle Street, Newcastle.
1860	Clephan, R. C.	High Bridge, Newcastle.
1869	Cobb, Joseph	Union Street, Sunderland.
1869	Cohen, A. N.	Tankerville House, West Jesmond.
1869	Collins, Ralph	Northumberland Sqr., North Shields.
1889	Conradi, Thomas M.	Roseville, Bensham, Gateshead.
1887	Cooper, William	11, Ridley Place, Newcastle.
1851	Coppin, John	Bingfield, Corbridge-on-Tyne.
1869	Corder, Alexander	1, Carlton Terrace, Sunderland.
1868	Corder, Francis	Princes Street, Sunderland.
1862	Cowen, Lt.-Col. J. A.	Blaydon Burn, Blaydon-on-Tyne.
1865	Cowen, Joseph	Stella House, Blaydon-on-Tyne.
1858	Cox, J. H.	33, Fawcett Street, Sunderland.
1860	Daglish, John	Marsden, South Shields.
1864	Dance, T. W.	2, Vernon Terrace, Gateshead.
1870	Davis, John, M.R.C.S.	North Bridge House, Sunderland.
1867	Davison, Edwin C.	23, Park Place, Sunderland.
O.M.	Dees, R. R.	Pilgrim Street, Newcastle.
1865	Dickinson, I. G.	Nat. Prov. Bank, Newcastle.
1865	Dickinson, Robert	The Arcade, Newcastle.
1858	Dinning, William	41, Eldon Street, Newcastle.
1863	Dixon, W. H., M.D.	35, Frederic Street, Sunderland.
1879	Dobson, James	17, Frederic Street, Sunderland.
1865	Dodds, Edwin	Low Fell, Gateshead.
1865	Dodds, J. B.	Edwards Road, Whitley.
1867	Dodds, M. S.	34, Quayside, Newcastle.
1849	Douglas, George, M.D.	Regent House, Bensham, Gateshead.
1864	Douglas, James	Winlaton, Blaydon-on-Tyne.
1865	Downie, Henry	Collingwood House, Tynemouth.
1876	Dresser, H. E.	6, Tenterden Street, London.
1860	Drewett, D. O.	Riding Mill-on-Tyne.
1878	Drummond, Charles J.	9, Spring Terrace, North Shields.
1860	Dunn, A. M	Castle Hill, Wylam-on-Tyne.
1868	Dunn, Henry	2, Marianople Street, Newcastle.
1868	Dunn, Septimus	Quayside, Newcastle.
1879	Eccles, Edward	South Close, Gateshead.
1879	Eccles, Thomas	Blyth.
1875	Edwards, R. D.	Nat. Prov. Bank, Durham.
1875	Ellis, Richard, M.D.	100, Rye Hill, Newcastle.
1870	Elsdon, W. B.	Grey Street, Newcastle.

Elected.		
O.M.	Embleton, D., M.D.	Claremont Place, Newcastle.
1887	Emley, Fred	7, Ellison Place, Newcastle.
1881	Fawcett, William	(Fawcett & Waugh), Quayside, N/C.
1873	Favell, T. M	14, Saville Street, North Shields.
1861	Featherstonehaugh, Edward...	13, Park Place West, Sunderland.
1877	Fedden, G. H.	Queen Street, Newcastle.
1880	Fell, Alfred	Hebburn-on-Tyne.
1861	Fenwick, George	Percy Gardens, Tynemouth.
1860	Fenwick, John	18, Saville Street, North Shields.
1876	Fletcher, John W.	20, Argyle Square, Sunderland
1858	Foster, G. B., M.A.	Lesbury, R.S.O., Northumberland.
1850	Foster, J. S.	Plawsworth, Chester-le-Street.
1884	Forth, R. Y.	Finney & Co., Mosley St., Newcastle.
1860	Foster, Robert	The Quarries, Clifton Rd., Newcastle.
1868	Fothergill, J. M.	1, Norham Place, West Jesmond, N/C.
1883	Fox, Rev. H. E.	South Bailey, Durham.
1872	France, George F.	Ford House, Felling, Gateshead.
1888	Franklin, Rev. Canon	St. Mary's Cathedral, Clayton Street.
1865	Fraser, Donald	Forth Goods Station, Newcastle.
1884	Garwood, Edmund J.	St. Mary's Place, Newcastle.
1883	Gatheral, George	Heathfield, Hebburn-on-Tyne.
1851	Gibb, C. J., M.D.	Westgate Road, Newcastle.
1855	Gibson, Charles, M.D.	Eldon Square, Newcastle.
1870	Gibson, Charles	16, Stanwick Street, Tynemouth.
1881	Gibson, H.	28, Northumb'land Sq., North Shields.
1880	Gilchrist, Thomas	Ovington Cottage, Ovington-on-Tyne.
1881	Gilhespy, William	24, Cambridge Street, Newcastle.
1872	Gillie, John	Westoe, South Shields.
1867	Gillies, Alexander	9, Ravensworth Terrace, Gateshead.
1885	Gjemre, L.	3, West Avenue, Gosforth.
1876	Glen, D. C.	14, Annfield Plain, Glasgow.
1881	Glendenning, G. H.	39, Jesmond Road, Newcastle.
1878	Glendenning, William	Grainger Street, Newcastle.
1864	Glover, John	20, Holly Avenue, Newcastle.
1876	Glover, William	St. Helen's Ter., Low Fell, Gateshead.
1874	Grace, W. Percy	Fellside House, Whickham.
1867	Graham, John	1, John Street, Sunderland.
1880	Graham, William	Lovaine Terrace, North Shields.
1865	Greaves, John	17, Nun Street, Newcastle.
1862	Green, Edward	Beverley Terrace, Cullercoats.
O.M.	Green, R. Y.	11, Lovaine Crescent, Newcastle.

Elected.		
1875	Green, Thomas	Garden House, Monkseaton
1854	Green, William	Thornley House, Blaydon-on-Tyne.
1872	Greene, C. R.	Oakfield, near Gateshead.
1877	Greenwell, G. C.	Elmtree Cottage, Duffield, Derby.
1884	Greenwell, Winship	Bothal, Morpeth.
1877	Hadaway, George	21, Washington Ter., North Shields.
1865	Hall, Rev. G. Rome	Birtley, Wark-on-Tyne.
1858	Hall, James	Palmer, Hall, & Co., Quayside, N/C.
1862	Hall, John	Ellison Place, Newcastle.
1875	Hall, Matthew	Borough Surveyor, South Shields.
O.M.	Hancock, John	St. Mary's Terrace, Newcastle.
1880	Hardie, William	Osborne Road, West Jesmond.
1849	Hare, John	Grey Street, Newcastle.
1882	Harkus, George	Elswick Road, Newcastle.
1864	Harrison, J. A.	Allendale House, Hexham.
1859	Haswell, F. R.	77, Tyne Street, North Shields.
1859	Havelock, Michael	Akenside Hill, Newcastle.
1886	Hedley, R. C.	Cheviot, Corbridge-on-Tyne.
1864	Hedley, T. F.	John Street, Sunderland.
1876	Hedworth, T. H.	Dunston, Gateshead.
1876	Henderson, M.	All Saints' Cemetery, Newcastle.
1889	Henzell, George C.	Colwell, Barrasford-on-Tyne.
1865	Henzell, W. M.	Belgrave Terrace, Newcastle.
1878	Henning, H. B.	Nat. Prov. Bank, Gateshead.
1877	Heslop, George, Jun.	St. George's Square, Sunderland.
1868	Heslop, R. Oliver	The Crofts, Corbridge-on-Tyne.
1877	Hetherington, David	Coxlodge Colliery, Gosforth.
1886	Hick, A. C.	1, Oxford Street, Newcastle.
1874	Hick, Rev. J. M.	Whickham, Gateshead.
1880	Higginbottom, A. H.	4, Percy Terrace.
1867	Hill, Alfred H.	Union Street, North Shields.
1865	Hobkirk, William	Farm Cottage, Cramlington.
1859	Hodgkin, Thomas, LL.D.	St. Nicholas' Square, Newcastle.
1864	Hodgson, W.	Elm Croft, Darlington.
1863	Hooppell, Rev. Dr., F.R.A.S.	Byers Green.
1882	Hope, Adam	Westoe, South Shields.
1874	Hopgood, J. F.	Clive House, Sunderland.
O.M.	Howse, Richard	12, St. Thomas' Crescent, Newcastle.
1865	Hudson, R. M.	Exchange Buildings, Sunderland.
1875	Hudson, Thomas	Thrift Street, South Shields.
1871	Humble, S. J.	West Street, Gateshead.
1858	Humble, Mrs.	Ashburn, Scarborough.

Elected.		
1881	Hunter, J. W.	24, Bewick Road, Gateshead.
1866	Huntley, D. P.	Ward Terrace, Sunderland.
1874	Huntley, F. C.	East Sunniside, Sunderland.
1867	Hutchinson, Cuthbert	Whitburn, Sunderland.
1876	Hutchinson, Henry	1, Wylam Road.
1867	Hutchinson, Joseph	The College, Durham.
1880	Hutchinson, William	Roseworth Villa, Gosforth.
1878	Hutton, George	Mosley Street, Newcastle.
1872	Hutton, John	Eden Vale, Castle Eden.
1878	Hutton, J. B.	Claremont Place, Newcastle.
1876	Hutton, T. G.	North Hetton Coal Co., John Street, Sunderland.
1881	Hymers, Henry	Regent Terrace, Gateshead.
1861	Irving, George	Central Station, Newcastle.
1878	Jackson, Joseph	25, Leazes Terrace.
1860	Jackson, Thomas	2, Camp Terrace, Tynemouth.
1865	Jackson, Thomas, Jun.	Percy Villas, Tynemouth.
1886	Jackson, W. B.	34, Grey Street, Newcastle.
1871	Johnson, Rev. A.	Healey, Riding Mill-on-Tyne.
1867	Johnson, A. W.	1, Elysium Place, Gateshead.
1889	Johnson, Hedley	49, Derby Street, Newcastle.
1875	Johnson, Rev. John	Hutton Rudby, Yarm.
1875	Johnson, Rev. William	9, Richmond Terrace, Gateshead.
1877	Joicey, James, M.P.	Longhirst, Morpeth.
1881	Jones, Thomas	Durham.
1876	Kaye, W. S., L.R.C.P.	Gladstone Terrace, Gateshead.
1885	Kelly, Bruce	2, Collingwood Street.
1867	Kidson, John	66, John Street, Sunderland.
1869	Kirkby, James W.	Kirkland, Leven, Fife.
1884	Kirton, Hugh	Waldridge Colliery, Chester-le-St.
1865	Knothe, Rudolph	Side, Newcastle.
1869	Laidler, G. G.	Northumberland Street, Newcastle.
1871	Lebour, Prof. G. A.	College of Physical Science, N'castle.
1868	Legge, Alfred	Mosley Street, Newcastle.
1878	Lilburn, Charles	Glenside, Sunderland.
1859	Lowrey, Edward	Lombard Street, Newcastle.
1865	Lowrey, Richard	Lea Villa, Riding Mill.
1859	Lyall, George, F.G.S.	48, East Winchester St., South Shields.

Elected.		
1887	Mackey, M.	8, Milton St., Shieldfield, Newcastle.
1852	Maling, C. T.	Ellison Place, Newcastle.
1880	Maling, John Ford	25, Eslington Terrace.
1863	Maling, E. A.	John Street, Sunderland.
1865	Maling, William	Granville Road, Newcastle.
1885	Margory, A. C.	Lovaine Crescent, Newcastle.
1878	Marley, J. E.	Hebburn-on-Tyne.
1871	Maughan, Rev. J. A. C.	The Vicarage, Prudhoe-on-Tyne.
1877	Maughan, William	2, Elswick Park, Newcastle.
1880	Maw, Thomas	Wallace Terrace, Ryton-on-Tyne.
1877	Mearns, Dr.	High West Street, Gateshead.
1860	Messent, Philip, C.E.	Tynemouth.
1870	Metcalf, J. S.	60, Percy Park, Tynemouth.
1867	Meynall, E. J.	Durham.
1876	Miller, Hugh, F.G.S.	51, Lauriston Place, Edinburgh.
1886	Miller, J. E.	Lovaine Place, North Shields.
1881	Mills, Leighton	71, Lovaine Terrace, North Shields
1888	Moffitt, Charles	Winlaton Iron Works.
1879	Moor, J. C.	Newcastle Journal Office, Sunderland.
1846	Moore, John	Beckenham, Kent.
1862	Moore, J. M.	Market Place, South Shields.
1866	Morgan, G. B.	Villiers Street, Bishopwearmouth.
1860	Morton, Rev. Henry	St. Stephen's Rectory, South Shields.
1882	Morton, Jos. Hall	1, Ravensbourne Ter., South Shields.
1880	Motum, Hill	Helensville, Grainger Park Rd., N/C.
1884	Moult, John	3, Gladstone Terrace, Gateshead.
1860	Murray, W., M.D.	Clayton Street, Newcastle.
1877	Neil, William	Deaf and Dumb Institution, N'castle.
1876	Nelson, R. C.	19, Roker Promenade, Sunderland.
1871	Nicholson, James	King Street, South Shields.
1860	Noble, Capt., C.B , F.R.S.	Jesmond, Newcastle.
1860	Norman, Rev. A. M., D.C.L.	Burnmoor Rectory, Fence Houses.
1879	Oliver, Thomas, M.B.	Eldon Square, Newcastle.
1881	Ormond, Richard	24, Grainger Street West, Newcastle.
1879	Oswald, Septimus	St. Nicholas' Buildings, Newcastle.
1877	Page, John	4, Alexander Crescent, Newcastle.
1867	Park, A. D.	Bigg Market, Newcastle.
1858	Pattinson, John	The Side, Newcastle.
1853	Peacock, Septimus	Sunderland.
1884	Peacy, R. D.	8, Moor View, Newcastle.

Elected.		
1872	Pearman, George W.	Mayfield, Sunderland.
1860	Peart, R. S., M.D.	22, Dockwray Square, North Shields.
1865	Peckett, J. C.	2, Park Place East, Sunderland.
1874	Peile, George	Shotley Bridge.
1860	Pemberton, R. L.	Hawthorn Tower, near Seaham.
1877	Peverley, R. B.	Quay, Newcastle.
1852	Philipson, G. H., M.A., M.D.	Eldon Square, Newcastle.
1854	Philipson, John	9, Victoria Square, Newcastle.
1866	Philipson, Joseph A.	15, Pilgrim Street, Newcastle.
1875	Pike, Thomas	Ocean Road, South Shields.
1861	Pilkington, Edward	6, Ulverston View, Sunderland.
1880	Pinkney, Thomas	John Street, Sunderland.
1868	Porrett, J. C.	Thornhill Park, Sunderland.
1883	Potts, John, M.D.	Sunderland.
1865	Proctor, Matthew	Osborne Terrace, Newcastle.
1860	Proctor, B. S.	Fern Avenue, Jesmond, Newcastle.
1882	Pumphrey, Thomas E.	Clifton Villas, Bishopwearmouth.
1861	Punshon, N.	Blackett Street, Newcastle.
1882	Pybus, James	6, Cleveland Road, North Shields.
1877	Pybus, W. M.	Post Office Chambers, Newcastle.
1874	Rea, James S.	Beverley Terrace, Cullercoats.
1862	Redmayne, J. M.	Newcastle.
1862	Redmayne, R. R.	Grey Street, Newcastle.
1879	Redpath, Robert	Linden Terrace, Newcastle.
1878	Reed, J. T. F., L.R.C.P.	Ryhope, Sunderland.
1865	Reid, David	Grey Street, Newcastle.
1877	Reid, Edwin O.	4, North Terrace, Newcastle.
1867	Reid, W. B.	Leazes Brewery, Newcastle.
1887	Reis, J. B.	14, Otterburn Terrace, Newcastle.
1879	Rhagg, Adamson	Haldane Terrace, Newcastle.
1876	Rich, F. W.	5, Eldon Square, Newcastle.
1876	Richardson, Thomas	4, Lesbury Terrace, Gateshead.
1880	Robson, A. H.	2, Esplanade, Sunderland.
1849	Robson, E. Capper	2, Esplanade, Sunderland.
1864	Robson, Fred.	Dean Street, Newcastle.
1882	Robson, John, Jun.	22, Washington Ter., North Shields.
1872	Robson, John E.	Sea View, Hartlepool.
1863	Robson, S. S.	13, Claremont Terrace, Sunderland.
1873	Robson, Shafto	Bewick Road, Gateshead.
1874	Robson, Stephen E.	11, Claremont Terrace, Sunderland.
1865	Robson, W. C.	166, Rye Hill, Newcastle.
1875	Rogers, Rev. Canon	Simonburn, Humshaugh.

Elected.		
1881	Rogerson, John	Croxdale Park, Durham.
1880	Ross, Andrew	Dean Street, Newcastle.
1878	Routledge, R.	Orchard Place, Hexham.
1889	Ryle, Robert	RavensworthCres.,LowFell,Gatesh'd.
1876	Ryott, W. H.	6, Sydenham Terrace, Newcastle.
1860	Sample, Thomas	Bothal Castle, Morpeth.
1870	Scorfield, E. S.	Quayside, Newcastle.
1883	Scott, Charles F.	Medomsley, Lintz Green.
1872	Scott, George	Westoe Terrace, South Shields.
1877	Scott, Walter	Holly House, Durham Rd., Sunderl'd.
1874	Shaw, Benjamin, M.A.	Clayton Park Road, Newcastle.
1867	Shaw, Fred.	55, Close, Newcastle.
1876	Shevill, W. H.	5, Avenue Terrace, Sunderland.
1880	Shewbrook, Edward	6, Lovaine Crescent, Newcastle.
1864	Shiel, George	Fawcett Street, Sunderland.
1867	Shiel, G. R.	The Cottage, Stockton Rd, Sunderl'd.
1873	Shiel, John	Framwellgate Colliery, Durham.
1861	Shields, John	Durham.
1866	Short, John	1, Camden Street, North Shields.
1869	Siddle, Robert	7, Derby Street, Sunderland.
1855	Simpson, J. B.	Hedgefield House, Blaydon-on-Tyne.
1859	Simey, Ralph	1, John Street, Sunderland.
1885	Sisson, W. E.	Cambridge Terrace, Gateshead.
1876	Smart, Collin	18, John Street, Sunderland.
1877	Smith, George	Grove Villa, South Gosforth, N'castle.
1882	Smith, James Edward	11, Camden Street, North Shields.
1879	Sopwith, H. T.	Tankerville Terrace, Newcastle.
1873	Southwell, Charles	Gurry Lodge, Kilburn, London.
1867	Spence, C. J.	North Shields.
1871	Spence, Faraday	Grey Street, Newcastle.
1861	Spence, Joseph	2, Priors Terrace, Tynemouth.
1858	Spence, J. F.	Chirton Cottage, North Shields.
1860	Spence, J. F., Jun.	Chirton Cottage, North Shields.
1858	Spence, Robert	Rosella Place, North Shields.
1881	Spence, R. F.	West Cramlington.
1874	Spencer, G. E.	Victoria Street, Newcastle.
1870	Spencer, J. P.	Town Hall, North Shields.
1861	Spencer, Thomas	The Grove, Ryton.
1865	Steele, Thomas	John Street, Sunderland.
1882	Stephens, Rev. Thomas	Horsley Vicarage, by Otterburn.
1875	Stephenson, James	Benwell.
1869	Stephenson, Thomas	3, Framlington Place, Newcastle.

Elected.		
1851	Stevenson, Alexander S.	Tynemouth.
1870	Storey, Samuel, M.P.	John Street, Sunderland.
1877	Storey, John, Mrs.	76, Lovaine Place, Newcastle.
1867	Stout, G.	Lovaine Place, Newcastle.
1868	Straker, Joseph H.	Stagshaw House, Corbridge.
1884	Strangeways, N.	59, Westmorland Road, Newcastle.
1880	Stuart, Thomas Wilson	Hebburn-on-Tyne.
1865	Sutherland, B. J.	Sandhill, Newcastle.
1859	Swan, J. W.	Bromley, Kent.
1876	Swanwick, E. M., L.R.C.P.	Church Street, West Hartlepool.
1862	Swithinbank, G. E.	Rothesay, Purley, Surrey.
1858	Tate, R. M.	20, Camden Street, North Shields.
1867	Taylor, Hugh	Chipchase Castle, Wark-on-Tyne.
O.M.	Taylor John	2, Lovaine Place, Newcastle.
1869	Temperley, N.	4, Carlton Ter., Low Fell, Gateshead.
1855	Temperley, W. A.	Hencotes Street, Hexham.
1867	Thackeray, William, Jun.	7, The Avenue, Sunderland.
1850	Thompson, Cuthbert	1, Oxford Villa, Brown's Road, Ewell Road, Surbiton, Surrey.
1889	Thompson, Mrs. George	Winlaton, Blaydon-on-Tyne.
1878	Thompson, George	18, Victoria Street, Newcastle.
1873	Thompson, Joseph	North Dene, Gateshead.
1858	Thompson, Thomas	Orchard House, Winlaton, Blaydon-on-Tyne.
1882	Thorpe, R. S.	Devonshire Terrace, Newcastle.
1861	Tone, W.	58, Villiers Street, Sunderland.
1883	Tranah, Arthur	Eldon Street, Newcastle.
1850	Tristram, Rev. Canon, F.R.S.	Durham.
1879	Tweddell, George	188, Westgate Road, Newcastle.
1873	Vann, S. R.	Durham.
1880	Veitch, Wm., L.R.C.P.	37, Grange Road, Middlesbro'.
1850	Vint, Robert	The Cedars, Sunderland.
1865	Waddington, Thomas	North Eslington Villa, Gateshead.
1866	Waite, James	23, Northumberland Sq., No. Shields.
1866	Waite, John	18, Latimer Street, Tynemouth.
1879	Walker, J. D.	21, Holly Avenue, Jesmond, N'castle.
1883	Walker, John	Eastfield House, Corbridge.
1888	Walmsley, Rev. Henry	Annitsford, Newcastle-on-Tyne.
1853	Warwick, John	11, Ashfield Terrace West, Newcastle.
1864	Watson, Mason	Prudhoe Street, Newcastle.

Elected.		
1869	Watson, Robert	Grey Street, Newcastle.
1861	Watson, R. S., LL.D.	Pilgrim Street, Newcastle.
1865	Watson, T. C.	21, Blackett Street, Newcastle.
1879	Watts, Rev. Arthur	The Rectory, Witton Gilbert.
1867	Wheeler, Rev. R. F.	
1867	Wheldon, John	58, Great Queen Street, London.
1876	White, W. H.	Killingworth House, Newcastle.
1868	Wiener, Martin	Exchange Buildings, Sunderland.
1863	Williamson, Sir H., Bart.	Whitburn Hall, Sunderland.
1864	Wilson, Henry	Westoe, South Shields.
1869	Wilson, Henry V.	Winchester Terrace, Newcastle.
1878	Wilson, Edward	Pilgrim Street, Newcastle.
1880	Wilson, J. Straker	23, Grey Street, Newcastle.
1851	Wilson, Ald. Thomas	Riding Mill-on-Tyne.
1881	Wilson, Thomas, M.D.	Carville House, Wallsend.
1872	Winter, J. M.	Market Street, Newcastle.
1861	Wood, Lindsay	South-hill, Chester-le-Street.
1879	Wood, John	2, Benton Terrace, Newcastle.
1874	Worswick, R. A.	Local Board Office, Saltburn.
1865	Youll, J. G.	Grainger Street West, Newcastle.
1881	Young, Charles G.	Dunkirk Terrace, Corbridge.
1874	Young, Col. J. R.	Windsor Terrace, Newcastle.
1864	Young, Miss	5, High West Street, Gateshead.

HONORARY MEMBERS.

Elected.		
1884	Airey, Sir G. B., M.A., F.R.S.	
1868	Baker, J. G.	Kew Gardens, London.
1861	Bate, C. Spence	Plymouth.
1861	Glaisher, James, F.R.S.	13, Dartmouth Terrace, London.
1861	Jones, Prof. T. Rupert, F.G.S.	Farnborough, Hants.
1863	Mennell, H. T., F.L.S.	20, Fenchurch Street, London.
1861	Oliver, Prof. D., F.L.S.	Kew Gardens, London.
1863	Perkins, V. R.	Wotton-under-Edge, Gloucester.
1884	Hardy, James	Old Cambus, Cockburnspath, N.B.
1884	Miller, Hugh	Lauriston Place, Edinburgh.

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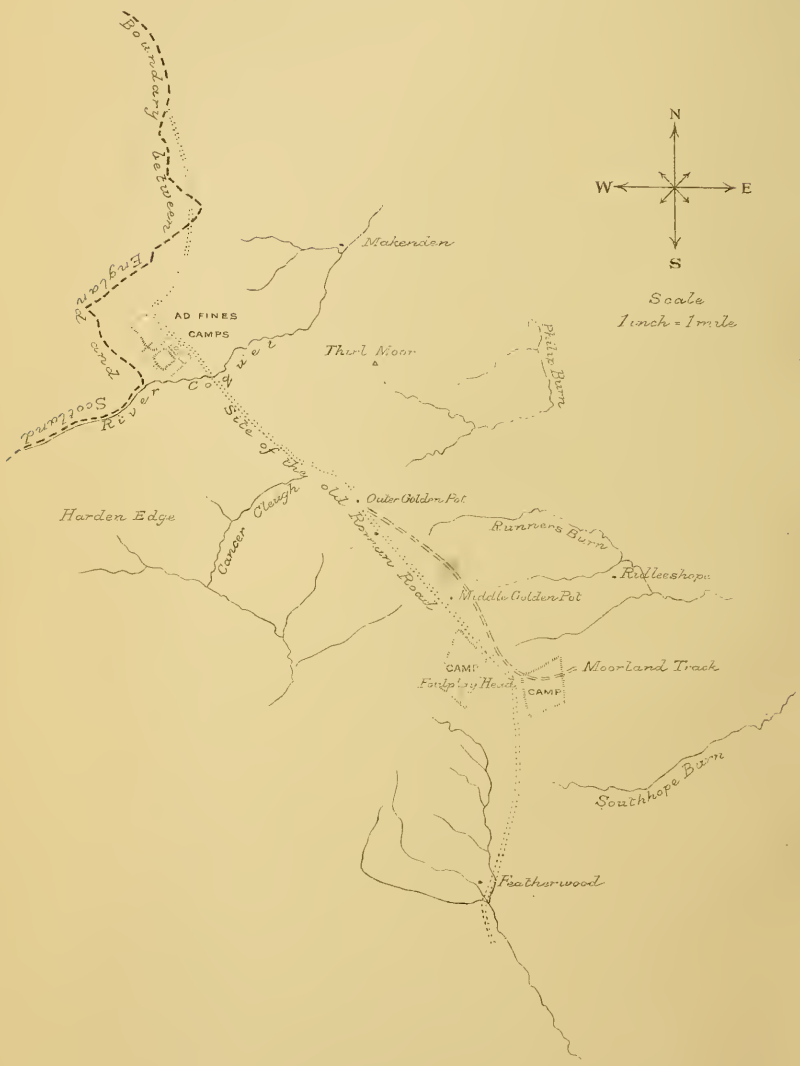

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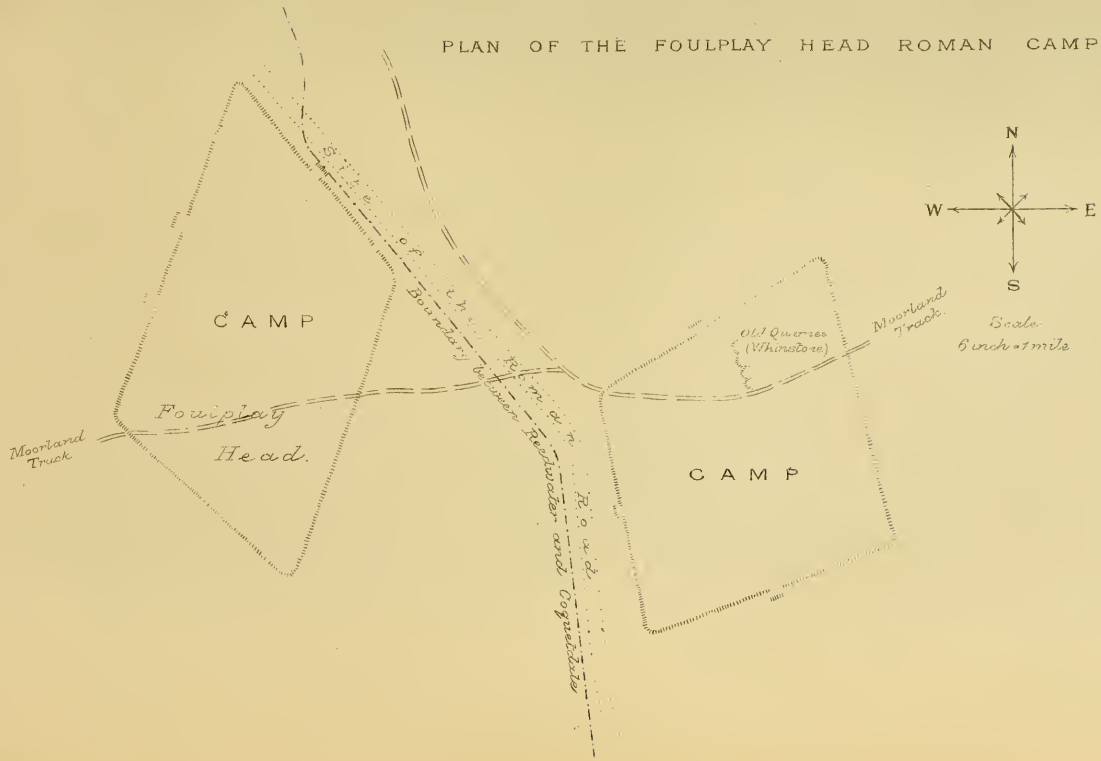

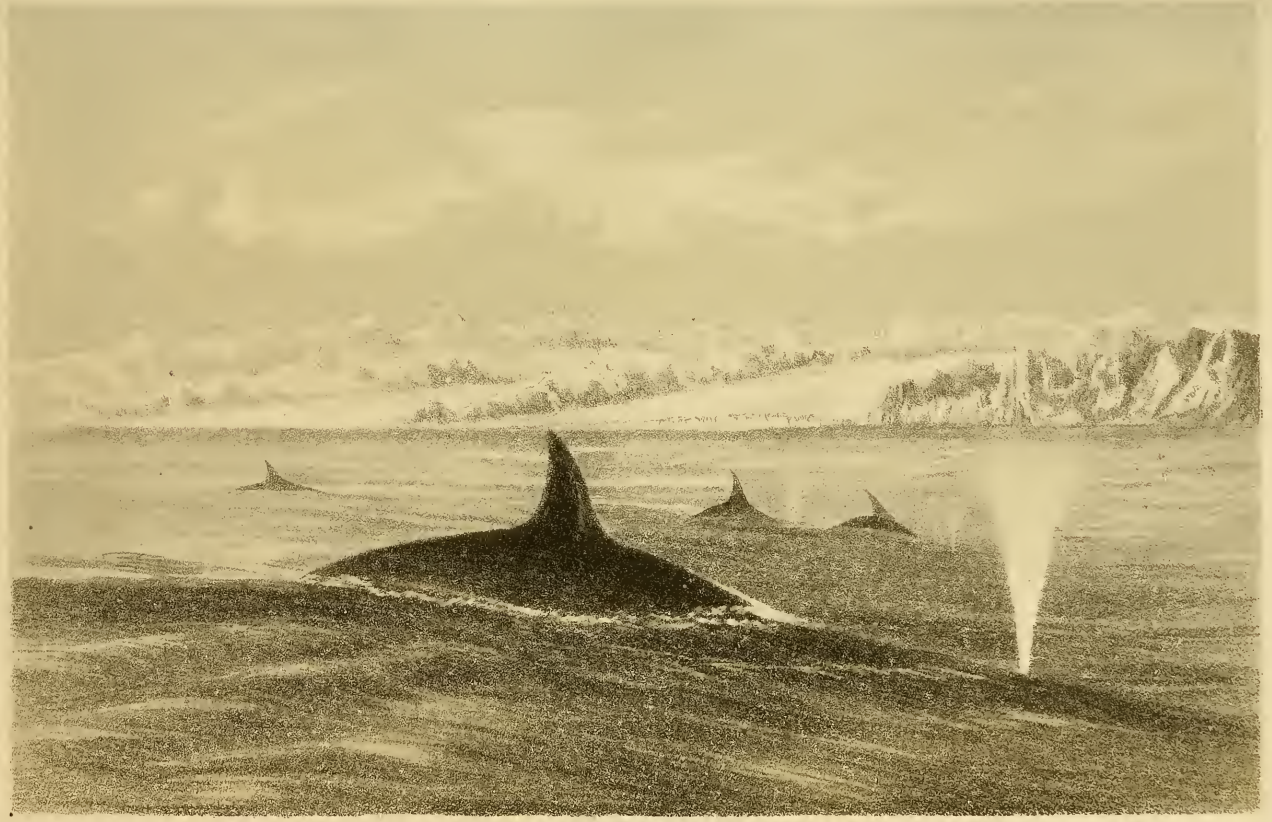

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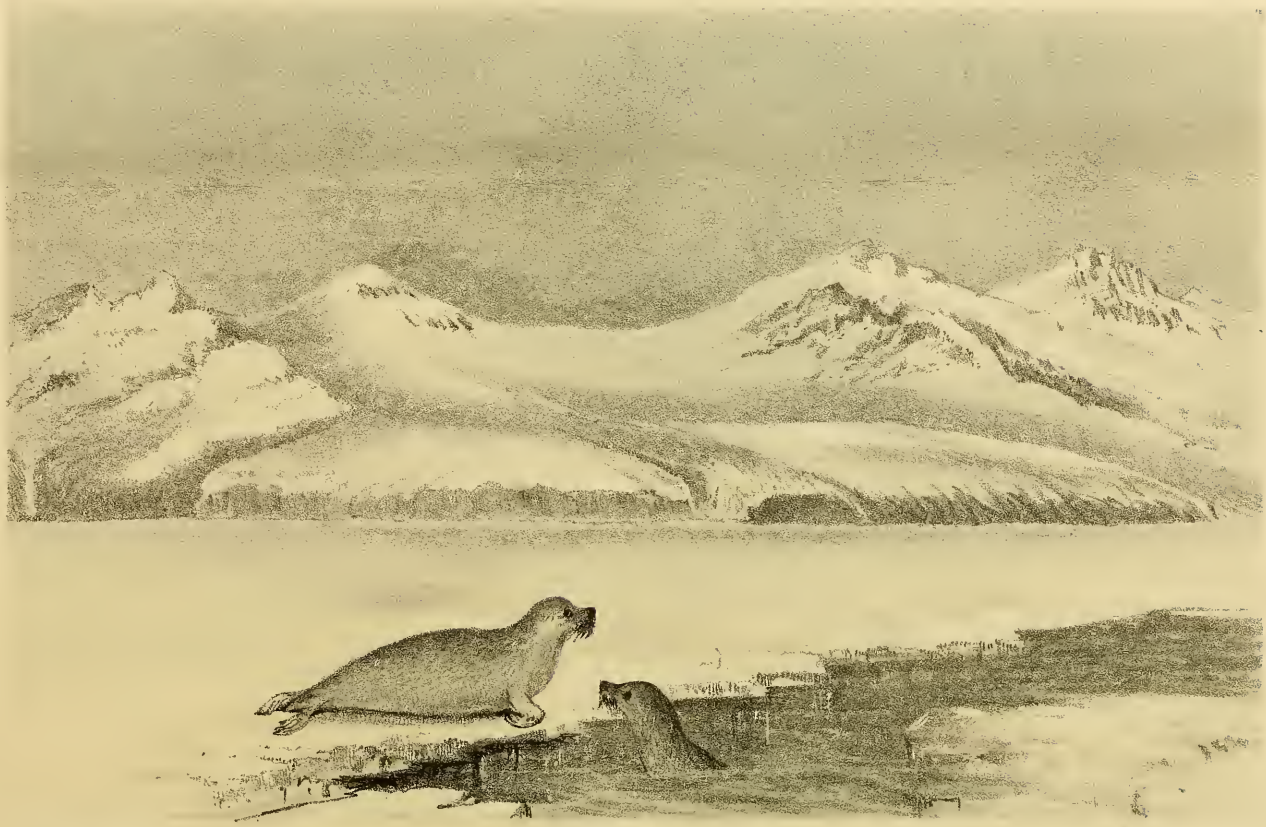
"FINNERS ON STARBOARD BOW"



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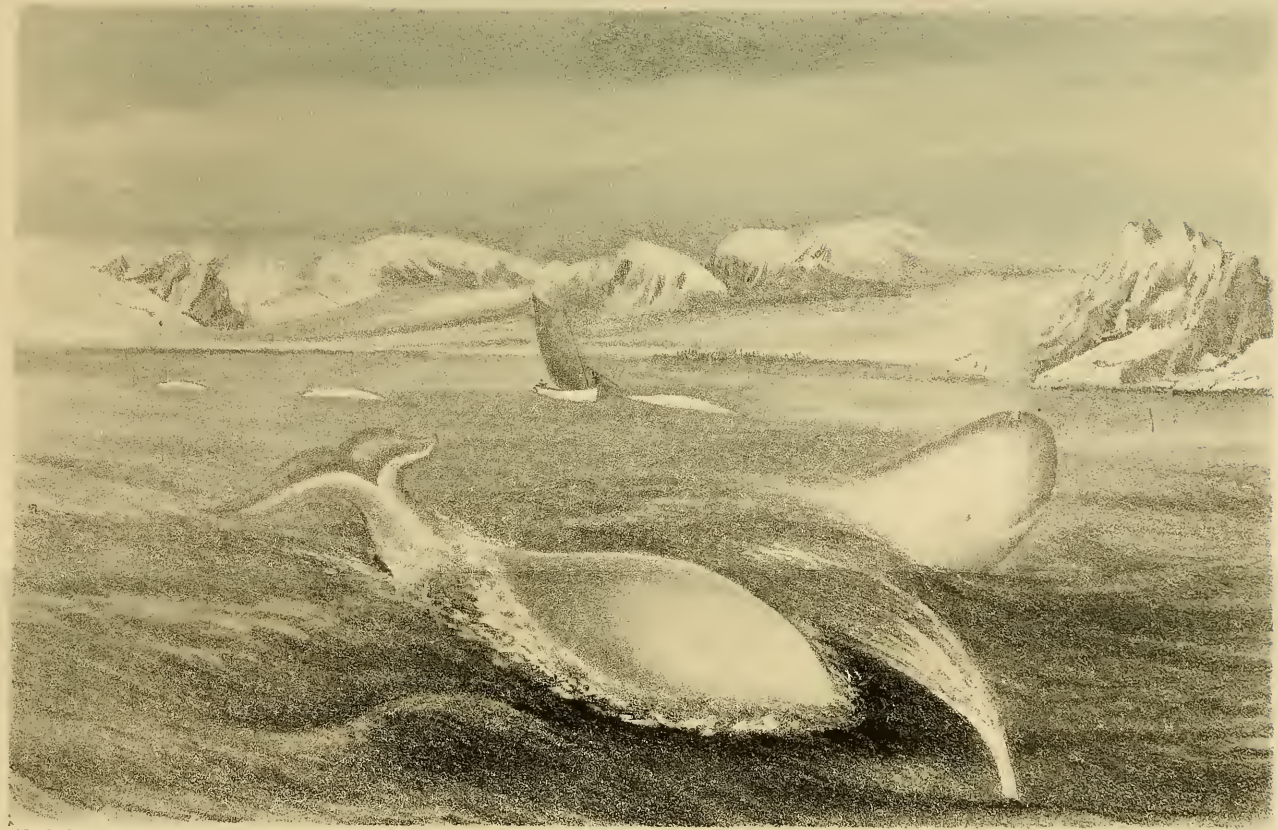

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WHITE WHALES.

HEAD OF VAN KEULEN'S BAY, BELSOUND.

Fig. 1. One Half Natural Size.

Fig. 2. ⅛ Natural Size.

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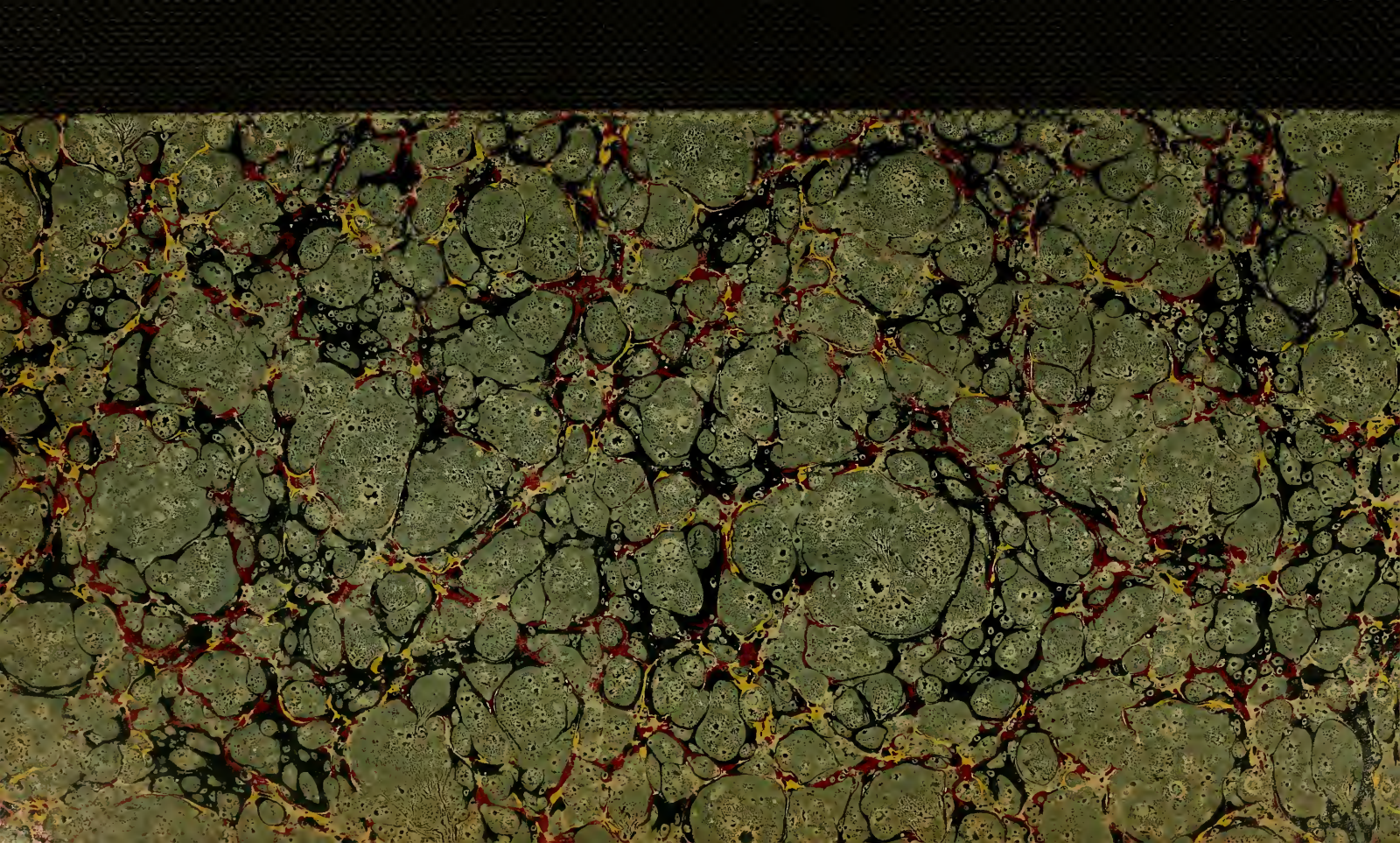
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